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Competition, Cooperation, and the
Emergence of Regional Centers in the Northern
Lake Titicaca Basin, Peru

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Anthropology

by

Abigail Ruth Levine

2012

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ABSTRACT OF THE DISSERTATION

Competition, Cooperation, and the Emergence of
Regional Centers in the Northern Lake Titicaca Basin, Peru

by

Abigail Ruth Levine

Doctor of Philosophy in Anthropology

University of California, Los Angeles, 2012

Professor Charles Stanish, Chair

Regional centers with dense populations developed in the Titicaca Basin during the late Middle (ca. 1300-500 BC) and early Upper Formative (ca. 500 BC- AD 400) Periods. These aggregated settlements have long been considered the hallmark of intermediate societies. This dissertation focuses on the transition from small village societies to ones with pronounced social, political, and economic hierarchies. In the northern Titicaca region, only two sites—Taraco and Pukara—became powerful centers during the Upper Formative, with only the latter ascending to regional dominance in the first century AD.

Using an evolutionary approach anchored in culture transmission theory, I examine the development of one of these sites—Taraco—over the course of the Formative Period. My research at Taraco suggests that through strategic participation in long-distance trade networks, residents were able to accumulate the resources required to finance local faction-building and

political expansion. Taraco likely functioned as a “transit community,” with individual households hosting passing caravans in exchange for presents of exotic goods. Ultimately, wealth gained through hosting was channeled towards a burgeoning political economy, which included public ceremonial activities featuring music (trumpets and pan-pipes), the burning of incense, and community-sponsored feasts. During these events, people obtained access to exotic goods, such as obsidian, and social bonds were cemented with gifts of high-status crafted goods.

Ultimately, Taraco’s success was short-lived. Excavations revealed that a high-status residential sector of the site was burned in the first century AD, after which economic and political activity in the area declined dramatically. The data strongly suggest that this site-wide burn event was an episode of deliberate destruction that represents evidence for intensive raiding. Coincident with this conflagration was the florescence of Pukara, which emerged as an expansive regional polity. These new data highlight the critical role of organized conflict in the formation of first-generation states and underscore the importance of both cooperative and competitive behaviors for the emergence of complex polities.

The dissertation of Abigail Ruth Levine is approved.

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2012

For H.B.

and

in memory of M.B.

TABLE OF CONTENTS

CHAPTER 1: COMPETITION, COOPERATION, AND THE EMERGENCE OF REGIONAL CENTERS.....	1
1.1 Introduction	1
1.2 Defining aggregated political centers	6
1.3 The evolution of human cooperation.....	7
1.4 Project design.....	9
1.5 Organization of the dissertation.....	10
CHAPTER 2: AGGREGATED POLITICAL CENTERS IN ARCHAEOLOGICAL PERSPECTIVE.....	13
2.1 Introduction	13
2.2 Regional centers in cross-cultural perspective	14
2.2.1 Trade.....	17
2.2.2 Specialization.....	21
2.2.3 Monuments.....	22
2.2.4 Rituals.....	23
2.3 An evolutionary framework for the development of regional centers	26
2.4 Models for the emergence of aggregated political centers.....	30
2.4.1 Factors influencing human cooperation	30
2.4.1.1 Coercive dominance.....	33
2.4.1.2 Environmental perturbations.....	38
2.4.1.3 Ideology	41
CHAPTER 3: THE NORTHERN LAKE TITICACA BASIN—ECOLOGY AND HISTORY	43
3.1 Introduction	43
3.2 Ecological history of the Titicaca region	45
3.2.1 Stable oxygen isotopes from ice caps.....	45
3.2.2 Diatom stratigraphy	49
3.2.3 Glacial history.....	52
3.2.4 Summary of circum-Titicaca Holocene climate trends	55
3.3 History of human occupation in the Titicaca Basin	56
3.3.1 The northern and southern Titicaca areas.....	57
3.3.2 Issues with chronology	59
3.3.4 The Formative Period in the Lake Titicaca Basin	61
3.3.4.1 Early Formative (beginning ca. 2000 BC).....	62
3.3.4.2 Middle Formative (ca. 1300-500 BC).....	63
3.3.4.3 Upper Formative (ca. 500 BC-AD 400)	68
3.4 Issues in defining and dating the Formative Period.....	69
3.4.1 A probabilistic perspective on Formative chronology	70
3.4.1.1 Potential issues with this approach	72
3.4.1.2 Results.....	75
3.4.2 Other issues for dating the Formative.....	81
CHAPTER 4: EARLY CENTERS IN THE LAKE TITICACA BASIN	87

4.1 Introduction	87
4.2 Identifying early centers: corporate architecture	88
4.3 Empirical patterns of the Middle and Upper Formative Periods.....	90
4.3.1 Early corporate architecture.....	90
4.3.2 Upper Formative innovations	95
4.4 Modeling the emergence of regional centers in the Titicaca Basin.....	98
4.4.1 Labor organization.....	100
4.4.2 Trade.....	102
4.4.3 Conflict	105
4.5 Summary.....	107
CHAPTER 5: TRACING THE DEVELOPMENT OF A REGIONAL CENTER: PROYECTO ARQUEOLÓGICO TARACO.....	109
5.1 Introduction	109
5.2 Setting.....	109
5.3 Taraco: background and previous research.....	110
5.3.1 Excavations in 2004.....	112
5.4 Research design	114
5.4.1 Excavation procedures.....	116
5.4.1.1 Logistics.....	116
5.4.1.2 Grid system and site mapping.....	116
5.4.1.3 Methods of excavation and sampling strategies	117
5.4.1.4 Methods of recording data	119
5.4.1.5 Archaeological preservation	120
5.4.2 Laboratory procedures.....	121
5.4.2.1 Ceramics	121
5.4.2.2 Lithics	124
5.4.3 Monitoring economic and political activities	124
5.4.3.1 Non-utilitarian finewares	130
5.4.3.2 Obsidian	134
5.4.4 Radiocarbon Dates.....	136
CHAPTER 6: EXCAVATIONS AT TARACO	137
6.1 Introduction	137
6.2 Unit II	139
6.3 Trench 1	170
6.4 Trench 1A.....	177
6.5 Profiles I and II.....	182
6.5.1 Profile I.....	183
6.5.2 Profile II.....	203
CHAPTER 7: MONITORING DOMESTIC PRACTICE	220
7.1 Introduction	220
7.2 Formative ceramics: special considerations	221
7.3 Results from the Huanané-Putina survey: a new approach to ceramic analysis ...	223
7.4 Bulk Ceramic Analysis.....	229
7.4.1 Analysis of form: results.....	230
7.4.1.1 Formative Phase 1.....	231

7.4.1.2 Formative Phase 2.....	232
7.4.1.3 Formative Phase 3.....	234
7.4.1.4 Temporal Patterns of Ceramic Forms.....	240
7.4.2 Decoration and style.....	252
7.4.3 Analysis of paste: results.....	256
7.4.3.1 Total sample.....	257
7.4.3.2 Temporal patterns of ceramic pastes.....	260
7.4.3.3 Paste and form.....	270
7.4.4 Petrographic considerations.....	276
CHAPTER 8: MONITORING LOCAL AND LONG-DISTANCE EXCHANGE	278
8.1 Introduction	278
8.2 Non-utilitarian ceramics.....	279
8.2.1 Statistical Treatment of Data.....	283
8.2.2 Results.....	285
8.3 Obsidian	298
CHAPTER 9: EVALUATING THE EMERGENCE OF A REGIONAL CENTER.....	303
9.1 Introduction	303
9.2 Cooperative strategies.....	305
9.2.1 Trade.....	305
9.2.2 Shifts in Subsistence.....	309
9.3 Competitive strategies.....	311
9.3.1 Conflict.....	311
9.3.1.1 Periodic episodes of burning.....	311
9.3.1.2 Thermal features associated with food preparation	313
9.3.1.3 Site-wide burning episode.....	314
9.4 The Upper Formative in regional perspective.....	320
CHAPTER 10: CONCLUSIONS	329
10.1 Introduction	329
10.2 Competition and cooperation in the north Basin Formative	331
10.3 Directions for future research.....	334
10.4 Conclusions	336
APPENDIX A Sample Field Forms.....	339
1. Capa/Nivel (Stratum/Level) form.....	339
2. Rasgo (Feature) form.....	339
3. Muestra de Tierra (Soil Sample) form.....	340
4. ¹⁴C Sample form.....	340
APPENDIX B Correspondence of arbitrary levels and natural stratigraphy (Units I and II).....	341
APPENDIX C Radiocarbon Dates from Area A	343
APPENDIX D Index of Ceramic Vessel Forms	345
1. Open Vessels	345
1.1. <i>Tazones</i> (direct-walled bowls).....	345
1.1.1 Type A.....	345

1.1.2 Type B.....	345
1.2 <i>Cuencos</i> (convex-walled bowls).....	346
1.2.1 Type A.....	346
1.2.2 Type B.....	346
1.2.3 Type C.....	347
1.2.4 Type D.....	347
1.2.5 Type E.....	347
1.3 <i>Platos</i> (plates).....	348
1.3.1 Type A.....	348
1.3.2 Type C.....	348
1.3.3 Type D.....	348
2. Closed Vessels.....	349
2.1 <i>Jarras</i> (jars).....	349
2.1.1 Type A.....	349
2.1.2 Type B.....	349
2.1.3 Type C.....	349
2.2 <i>Cantaros</i> (large jars).....	350
2.2.1 Type A.....	350
2.2.2 Type B.....	350
2.3 <i>Ollas</i> (cooking pots).....	350
2.3.1 Type A.....	350
2.3.2 Type B.....	351
2.3.3 Type C.....	351
2.3.4 Type D.....	351
2.3.5 Type E.....	351
2.4 <i>Botellas</i> (bottles).....	352
2.4.1 Type A.....	352
2.5 <i>Vasos</i>	352
2.5.1 Type A.....	352
APPENDIX E Analysis of Formative Ceramic Forms: Results.....	353
APPENDIX F Key for Pottery Illustrations.....	356
Appendix G Pottery Illustrations.....	357
1. Formative Phase 1.....	357
1.1 Serving.....	357
1.2 Cooking.....	358
1.3 Storage.....	360
1.4 Decorated Body Sherds.....	360
2. Formative Phase 2.....	361
2.1 Serving.....	361
2.2 Cooking.....	367
2.3 Storage.....	371
2.4 Non-Domestic Forms.....	372
2.5 Decorated Body Sherds.....	373
3. Formative Phase 3.....	374
3.1 Serving.....	374

3.2 Cooking	378
3.3 Storage	382
3.4 Non-Domestic Forms	385
3.5 Decorated Body Sherds	386
REFERENCES CITED.....	387

LIST OF FIGURES

Figure 1.1. Map of the far northern Titicaca Basin showing Formative sunken court sites discovered during survey of the Huancané-Putina and Taraco-Arapa areas. Image courtesy of C. Stanish.	4
Figure 3.1. The Lake Titicaca Basin, showing sites mentioned in the text	44
Figure 3.2. Yaya-Mama stela from Chiripa, Bolivia (Chávez 2004:88); ceramic trumpet (Chávez 2004:82).....	67
Figure 3.3. Summed probability distribution curve for calibrated ¹⁴ C dates associated with Qaluyu pottery	76
Figure 3.4. Summed probability distribution curve for calibrated ¹⁴ C dates associated with Pukara pottery	77
Figure 3.5. Superimposed summed probability distribution curves for Qaluyu and Pukara associated ¹⁴ C dates.	78
Figure 3.6. Linear regression of Qaluyu and Pukara associated probability densities, 200 B.C.-A.D. 1 at decadal intervals.....	79
Figure 3.7. Radiocarbon calibration curve for the north Basin Formative Period.....	82
Figure 4.1. Sunken court complex at Pukara	96
Figure 5.1. The Taraco site area.....	111
Figure 5.2. Area A (Patamoya) at Taraco	113
Figure 6.1. Area A (Patamoya) with excavation areas indicated.....	139
Figure 6.2. Diagram of Unit II showing interior subunits	140
Figure 6.3. Excavation profile of Unit I and II with occupations and ¹⁴ C dates indicated. Unit I was excavated by Stanish in 2004.	141
Figure 6.4. Surface of Stratum UII-X with features indicated.....	152
Figure 6.5. TA-1815. Pukara style zone-incised polychrome <i>incensario</i> sherd.....	155
Figure 6.6. Plan of Structure UII-1 showing interior and exterior activity surfaces	157
Figure 6.7. Tools discovered in Lot 6. Andesite discoïd and worked bone fragments.....	159
Figure 6.8. Feature UII-10	160
Figure 6.9. TA-1907	162
Figure 6.10. Feature UII-14 before and after removal of the slab.	166
Figure 6.11. Diagram of Trench 1 showing interior subunits.....	170
Figure 6.12. Profile drawing of Trench 1.	171
Figure 6.13. Features T1-1 and T1-2	174

Figure 6.14. Location of Trench 1A in relation to Trench 1.....	177
Figure 6.15. Slab-cist tomb (Feature T1-5) inside of pit feature T1-4.	181
Figure 6.16. Profile I-2, Structure PI-2.....	189
Figure 6.17. Structure PI-1.....	194
Figure 6.18. Structure PI-7.....	200
Figure 6.19. Burial PI-1	203
Figure 6.20. Feature PII-11	208
Figure 6.21. Structure PII-9. Possible storage bins associated with Phase 2 occupation	212
Figure 6.22. Contiguous rectangular bins used for above ground storage at Omo M11. (Redrawn from Goldstein 2005:Figure 6.22)	213
Figure 6.23. Structure PII-11, as seen from the top of Profile II-12.....	218
Figure 7.1. Phase 2 <i>incensario</i> (TA-1986-01).	234
Figure 7.2. Classic Pukara style feline from Huatacoa; Taraco feline (TA-1229-01).....	239
Figure 7.3. Distribution of ceramic forms by Formative occupational phase	240
Figure 7.4. Boxplot showing decrease in mean bowl size over time.....	242
Figure 7.5 Zone-incised polychrome sherd from Taraco depicting the feline headed snake motif described by Chávez.....	253
Figure 7.6. Zone-incised polychrome sherd from Taraco possibly depicting camelid motif illustrated by Chávez	254
Figure 7.7. Polychrome zone incised <i>incensario</i> sherds.....	254
Figure 7.8. <i>Tazones</i> from Profile II with incised and polychrome decoration	255
Figure 7.9. Distribution of paste groups in the total sample of analyzed ceramics	258
Figure 7.10 Distribution of paste groups within Formative occupational phases.....	261
Figure 7.11 Distribution of paste groups: Formative Phase 1	262
Figure 7.12 Distribution of paste groups: Formative Phase 2	263
Figure 7.13 Distribution of paste groups: Formative Phase 3	264
Figure 7.14 Distribution of paste groups: Huaña Activity Surface 2	268
Figure 7.15 Distribution of form categories within paste groups	274
Figure 7.16 Distribution of paste groups within form categories	275
Figure 8.1. Huancané-Putina and Taraco-Arapa survey areas with Formative sites indicated (image courtesy of C. Stanish).	281
Figure 8.2. Principal components bi-plot (calculated from the correlation matrix) showing principal chemical patterning and identified chemical groups.....	286

Figure 8.3. Bivariate K-Mg (log base 10 ppm) plot showing chemical distinctiveness of chemical groups 2, 3, 6 and 7.....	286
Figure 8.4. Bivariate Zr-Sm (log base 10 ppm) plot showing distinction between chemical groups 1, 2, and 5.....	287
Figure 8.5. Bivariate Pb-Be plot (log base 10 ppm) showing distinctiveness of chemical groups 4 and 8.....	287
Figure 8.6. Bivariate Zr-B (log base 10 ppm) plot showing association of unassigned samples with chemical groups 1 and 5.....	288
Figure 8.7. Distribution of ICP Groups by occupational phase.....	293
Figure 9.1. ¹⁴ C dates associated with site-wide burn event with 2-σ ranges indicated.....	317
Figure 9.2. Double-spout and bridge bottle discovered at Huatacoa.....	323
Figure G.1. <i>Tazones</i> , Formative Phase 1.....	357
Figure G.2. Necked <i>Ollas</i> (Types A and B), Formative Phase 1.....	358
Figure G.3. Neckless <i>Ollas</i> (Type D), Formative Phase 1.....	359
Figure G.4. Short-necked <i>Ollas</i> (Type E), Formative Phase 1.....	360
Figure G.5. <i>Jarra</i> , Formative Phase 1.....	360
Figure G.6. Wide-line incised body sherds, Formative Phase 1.....	360
Figure G.7. <i>Tazones</i> (Type A), Formative Phase 2.....	361
Figure G.8. <i>Tazones</i> (Type B), Formative Phase 2.....	362
Figure G.9. <i>Tazones</i> (Type B), Formative Phase 2.....	363
Figure G.10. <i>Tazones</i> (Type B), Formative Phase 2.....	364
Figure G.11. <i>Cuencos</i> (Type A), Formative Phase 2.....	365
Figure G.12. <i>Cuencos</i> (Type B), Formative Phase 2.....	366
Figure G.13. <i>Cuencos</i> (Type D), Formative Phase 2.....	367
Figure G.14. Necked <i>Ollas</i> (Type A), Formative Phase 2.....	367
Figure G.15. Necked <i>Ollas</i> (Type B), Formative Phase 2.....	368
Figure G.16. Neckless <i>Ollas</i> (Type D), Formative Phase 2.....	369
Figure G.17. Short-necked <i>Ollas</i> (Type E), Formative Phase 2.....	370
Figure G.18. <i>Jarras</i> (Types A, B, and C), Formative Phase 2.....	371
Figure G.19. Wide-line and zone-incised polychrome <i>incensario</i> fragments, Formative Phase 2.....	372
Figure G.20. Trumpet with wide line-incision and punctate decoration, Formative Phase 2....	372
Figure G.21. Body sherds with incised, punctate, and polychrome decoration, Formative Phase 2.....	373

Figure G.22. Selected <i>Tazones</i> (Type A), Formative Phase 3	374
Figure G.23. Selected <i>Tazones</i> (Type B), Formative Phase 3	375
Figure G.24. Selected <i>Cuencos</i> (Type A), Formative Phase 3	376
Figure G.25. Selected <i>Cuencos</i> (Type B), Formative Phase 3.....	377
Figure G.26. <i>Cuencos</i> Type D and E, Formative Phase 3	377
Figure G.27. Selected necked <i>Ollas</i> (Type A), Formative Phase 3	378
Figure G.28. Selected necked <i>Ollas</i> (Type B), Formative Phase 3	379
Figure G.29. Neckless <i>Ollas</i> (Type D), Formative Phase 3.....	380
Figure G.30. Short-necked <i>Ollas</i> (Type E), Formative Phase 3	381
Figure G.31. Selected <i>Jarras</i> (Type A), Formative Phase 3.....	382
Figure G.32. Selected <i>Jarras</i> (Type B), Formative Phase 3.....	383
Figure G.33. <i>Botellas</i> , Formative Phase 3	383
Figure G.34. Selected <i>Cantaros</i> (Type A), Formative Phase 3	384
Figure G.35. Selected <i>Cantaros</i> (Type B), Formative Phase 3	384
Figure G.36. <i>Incensario</i> sherds, Formative Phase 3	385
Figure G.37. Feline <i>incensario</i> applique (TA-1229-01), Formative Phase 3	385
Figure G.38. Selected trumpets, Formative Phase 3	385
Figure G.39. Selected body sherds with punctate, incised, and polychrome decoration, Formative Phase 3	386

LIST OF TABLES

Table 7.1. Distribution of paste groups by form type	273
Table 8.1. Distribution of ICP groups by site area	292
Table 8.2. Counts and weights for obsidian and non-obsidian flaked tools and debitage	302
Table C.1. ¹⁴ C Samples from 2006 and 2007 Excavation Seasons (collected by A. Levine) ...	343
Table C.2. ¹⁴ C Samples from 2004 Excavation Season (collected by C. Stanish)	344

LIST OF SUPPLEMENTARY MATERIALS

Supplementary Material 1: Illustration of Profile I, Area A, Taraco

Supplementary Material 2: Illustration of Profile II, Area A, Taraco

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PUBLICATIONS

Stanish, C. and A. Levine

2011 War and Early State Formation in the Northern Titicaca Basin, Peru. *Proceedings of the National Academy of Sciences* 108(34):13901-13906.

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2011 A Case for Local Ceramic Production in the Jequetepeque Valley during the Late Horizon. In *From State to Empire in the Jequetepeque Valley*, edited by C. M. Zori and I. Johnson, pp. 169-177. British Archaeological Reports (BAR) International Series, Oxford.

Klarich, E.A., A. Vranich, and A.R. Levine, eds.
In Press *Advances in Titicaca Basin Archaeology II*. Cotsen Institute of Archaeology Press, Los Angeles.

A.R. Levine, C. Chávez, A. Plourde, A. Cohen, and C. Stanish
In Press Emergent Complexity in the Northern Titicaca Basin. In *Arqueología de la Cuenca del Titicaca*, edited by L. Flores Blanco and H. Tantaleán. Universidad de San Marcos, Lima.

Levine, A.R, C. Stanish, P.R. Williams, C. Chávez, and M. Golitko
n.d. Trade and Early State Formation in the Northern Titicaca Basin, Peru.
Manuscript submitted to *Latin American Antiquity*.

PRESENTATIONS

Levine, A.R.
2005 The Chimú-Inka Style: The Importance of Hybridization to the Study of Culture Contact. Paper presented at the 70th Annual Meeting of the Society for American Archaeology, Salt Lake City.

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2006 A Case for Local Pottery Production in the Jequetepeque Valley during the Late Horizon. Paper presented at the 71st Annual Meeting of the Society for American Archaeology, San Juan.

Levine, A.R.
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Levine, A.R.
2011 Mold-Made Pottery and Temporal-Spatial Dynamics at Farfán during the Late Horizon. Paper presented at the 76th Annual Meeting of the Society for American Archaeology, Sacramento.

Levine, A.R. and C. Stanish
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CHAPTER 1: COMPETITION, COOPERATION, AND THE EMERGENCE OF REGIONAL CENTERS

1.1 Introduction

The emergence of aggregated political centers is one of the most important transitions in the evolution of human complex societies (Feinman and Marcus 1998). Archaeologically, this change can be recognized by the appearance of a number of principal centers and a hierarchical settlement pattern (Stanish 2001b). In anthropological terms, these principal centers are significant because they suggest a level of supra-community political control, as well as a relatively more centralized decision-making hierarchy (Earle 1987a; Spencer 1998). Such a major settlement shift would have required a number of economic, political, and social transformations, including the institutionalization of cooperative social norms (Stanish and Haley 2005). More specifically, it reflects a new order of interdependence among communities (Flannery 2002), a reorganization of labor (Arnold 1993, 1996; Steponaitis 1991), and an increased emphasis on surplus, which is essential for local faction building and political expansion (Field, et al. 2011; Spencer 1998). Over time, the communities that successfully adapt

to these changing conditions have a distinct advantage over others that do not, leading to differential concentrations of resources and power across the region (Stanish and Levine 2011). The northern Titicaca region presents a prime example of this process—out of the numerous competing sites that characterized the Middle Formative (1300-500 BC), only two places became powerful centers during the Upper Formative (500 BC-AD 400).

It is only recently that the concept of multiple competing centers vying for political and economic power was even a viable hypothesis worthy of testing with archaeological data. A wealth of recent research has laid the groundwork for this investigation, and points to the interaction of many non-state polities across a regional landscape as the context from which more complex forms of socio-political organization emerge (Flannery and Marcus 2003; Marcus 1998, 2008; Spencer 2003; Stanish 2001b). In the northern Titicaca Basin, archaeological research conducted over the last two decades or so has similarly revised our understanding of the origin and development of complex societies in the region, producing numerous data that refute the traditional, linear conception of culture history that has long typified the region.

In the traditional schema, Qaluyu was viewed as the first complex culture in the region, developing out of the first settled villages circa 1300 BC. Qaluyu was represented in the material record by a fine pottery style characterized by highly burnished, dark brown or red serving wares, which were often embellished with shallow, curvilinear incisions. It was believed that during this phase, settlement in the northern Titicaca area consisted of a limited number of small temples that were visited by pilgrims who lived in the small hamlets that were scattered about the surrounding area. The archaeological site of Qaluyu, discovered more than 50 years ago, was the type-site for this period.

In the traditional chronology, Qaluyu was immediate followed by Pukara, which dates from approximately 500 BC to AD 400. Like Qaluyu, Pukara was also defined by a distinctive pottery style that included iconic zone incised polychrome ritual paraphernalia, along with polished redwares and a number of plainware types. During this period, the populations of the region fell under the influence of the monumental site of Pukara, the major civic-ceremonial center located northwest of Lake Titicaca. Settlement in the region was characterized by a limited number of small to mid-sized temples located on hillsides that served as pilgrimage sites for people living in the surrounding villages and hamlets.

The lack of Tiwanaku-style materials in the region following the collapse of Pukara led many scholars to believe that there was a cultural hiatus lasting nearly two centuries before Tiwanaku finally came to occupy the area around AD 600. Tiwanaku peoples lived in the north Basin in relative tranquility until circa AD 1100. The collapse of Tiwanaku ushered in a period of political instability marked by warring factions. These rival *señoríos* were ultimately subjugated by the rapidly expanding Inka Empire, which annexed the Titicaca area around AD 1450.

However, recent work challenges many of these traditional interpretations, and offers a new perspective on the development of social complexity in the region. The first of these new developments is that corporate architecture in the region begins quite early, and is far more ubiquitous than previously realized. At the site of Huatacoa in the Pukara Valley, Amanda Cohen (2010) discovered one of the earliest sunken court constructions, which dated to 1400 BC—a time that roughly corresponds with Hastorf's earliest contexts at Chiripa, the iconic early center on the Bolivian side of the lake. Aimée Plourde's (2006) work at Cachichupa, in the far northeastern Basin, has shown that the first use of massive terracing occurs more or less at the

same time. It is now possible to state with much certainty that the first forms of non-domestic architecture appear around the 15th century BC.

Moreover, extensive survey has shown that there are actually many more sunken court sites than previously thought (Figure 1.1). Work by Charles Stanish and colleagues in the Huancané-Putina and Taraco-Arapa regions found that there were scores, if not hundreds, of these types of sites distributed throughout the region (Stanish and Umire 2004). This survey work also identified several more sites with stone stelae, which are almost always associated with ritual activities and sunken court constructions.

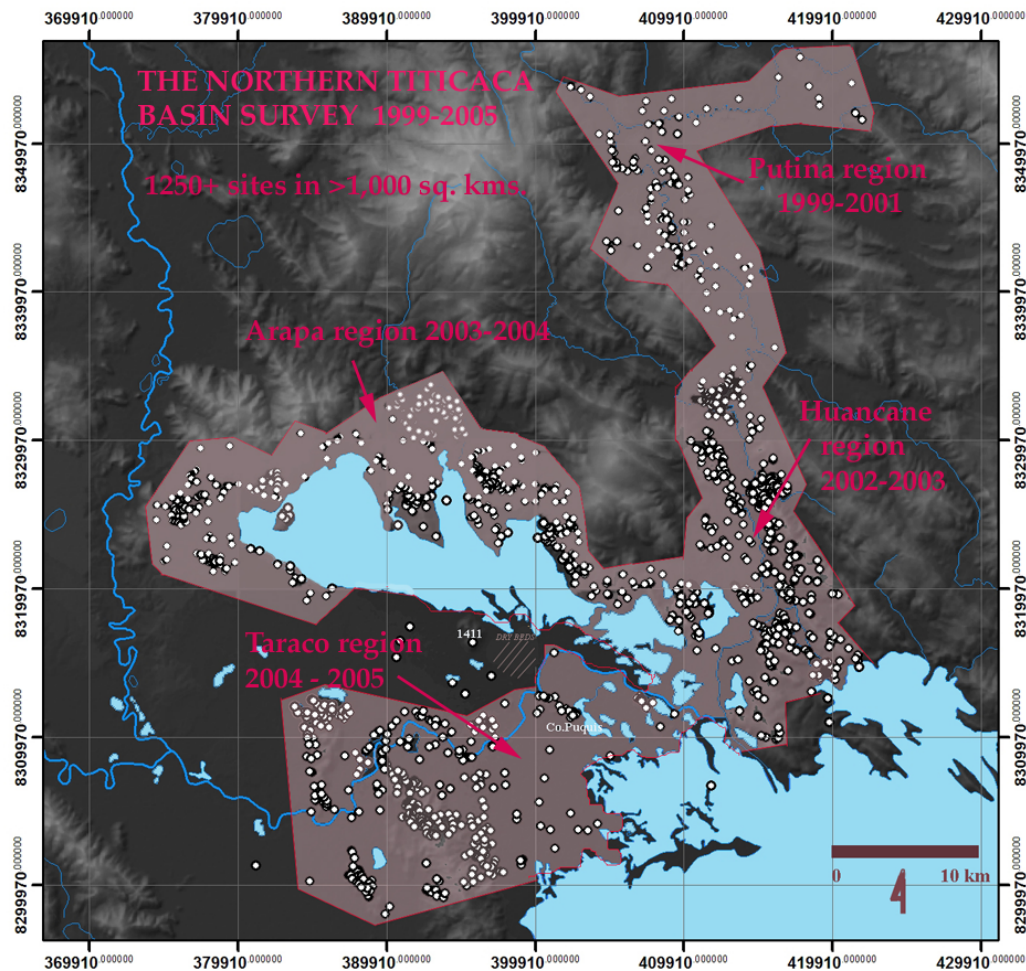


Figure 1.1. Map of the far northern Titicaca Basin showing Formative sunken court sites discovered during survey of the Huancané-Putina and Taraco-Arapa areas. Image courtesy of C. Stanish.

Investigation of these sunken court sites provided evidence indicating that they were not purely centers of ritual activity. Rather, these sites also hosted substantial residential populations, and had significant industrial components. For instance, at the site of Huajje, Carol Schultze and her team identified evidence of silver production in a U-shaped pyramid structure beginning around AD 100 and continuing over the next 1900 years. This production debris was associated with ritual paraphernalia including incense burners, as well as domestic artifacts, including weaving tools and utilitarian pottery (Schultze, et al. 2009). These data indicate not only that people lived in this structure, but also that it was the locus of a full range of residential, ritual, and industrial activities. This pattern was confirmed by Cohen's work at Huatacoa, as well as Plourde's work at Cachichupa.

New data also point to increased competition among north Basin communities by circa 500 BC, well before trophy head iconography appears on Pukara stelae. Survey work by Elizabeth Arkush identified a number of hilltop fortresses—traditionally only associated with the occupation of the Late Intermediate Period—with substantial Formative components (Arkush 2005). Survey data from the Huanané-Putina region exhibit this pattern as well. Lisa Cipolla excavated one of these hilltop settlements and obtained a radiocarbon date¹ in the first century AD for the initial construction of the fortifications. Likewise, the excavations at Huatacoa yielded what appear to be trophy heads in association with the Late Qaluyu occupation, which dates to approximately 800-200 BC (Cohen 2010:205-209).

A final complicating factor is that the Qaluyu and Pukara material styles no longer seem to represent discrete, sequential phenomena, as previously assumed. Ceramic analysis by Cecilia Chávez (2008) of the excavation and survey materials has proven that the same paste types—

¹ AA53817. Site HU-081; charcoal; 1994 ± 42; 108 BC - AD 120 95.4%; OxCal 4.0. This date was obtained by Ms. Lisa Cipolla, a member of Programa Collasuyu.

pastes with definite chronological implications—were associated with both Pukara and Qaluyu decorative styles. Her results, discussed in further detail in Chapter 7, reinforce the idea that these styles were used simultaneously, at least for a period of time.

Together, these new data suggest a political landscape that is very different than that implied by the traditional culture history. Pukara can no longer be viewed as the culmination of a single, linear trajectory of cultural development, but rather, it was likely one of many sites vying for regional economic and political power. The settlement data suggest that over time, there were fewer and fewer of these sites, but these sites were larger and more powerful than anything that had previously existed. Ultimately, a handful of sites became what can be considered aggregated political centers—regional nodes of social, economic, and political activities. Identifying the processes that contributed to this transformation in the regional settlement system ca. 500 BC-AD 100 is a primary objective of this dissertation.

1.2 Defining Aggregated Political Centers

A full discussion of the features of aggregated political centers is presented in Chapter 2 immediately following this introduction. Aggregated political centers are a universal feature of human complex societies. Cross-culturally, they have been referred to by many terms, including multiple mound primary centers (Blitz 1999), primate centers (Stanish 2003), primary centers (Kowalewski 1990), and towns (Schreiber and Lancho Rojas 1995). In archaeological terms, they are the hallmark of chiefly societies and multi-community polities, and introduce a new level of hierarchy in the regional settlement pattern. They are not simply larger or expanded versions of the surrounding settlements, but rather they are more complex and differentiated, often containing evidence of public architecture, ceremonial activities, agricultural

intensification, and access to exotic goods. These places are hubs of social, economic, and political life. Though evidence of their influence may be found across a large geographical area, this does not imply that these centers exert control over smaller, neighboring settlements. While this may be the case in some instances, it is likely that the earliest incarnations of these central places were deeply integrated into regional social and political systems, and required the support of neighboring communities in order to resist collapse and continue their expansion. Success of these centers also hinged on the development of critical technological and social adjustments aimed at concentrating and coordinating increasing numbers of people.

1.3 The Evolution of Human Cooperation

In this dissertation, I present an empirical and theoretical analysis of the emergence and development of regional centers in the northern Lake Titicaca Basin of Peru. The processes associated with major settlement shift may be best analyzed and understood within the framework of cultural transmission theory. Such a framework, based on the work of Durham (1991) and Boyd and Richerson (2005), is appropriate for this study, as the transition from dispersed villages to multi-community polities represents an important example of cultural evolution. This approach explains social, political, and economic developments in evolutionary terms, and emphasizes the role that culture, understood here as learned information, plays in shaping human behavior. In this perspective, the presence and/or absence of cultural traits is understood as dependent on the complex processes of human decision-making. Moreover, it offers a mechanism for explaining the adoption, perpetuation, and institutionalization of social norms. As such, it is a powerful tool for approaching this important transition in the history of human occupation in the northern Titicaca area.

Within the umbrella of culture transmission theory is the more precise concept of the evolution of cooperation (Boyd, et al. 2005; Henrich, et al. 2001; Henrich and Smith 2004; Stanish and Haley 2005). Such a perspective is especially useful for this analysis because aggregated political centers, composed of numerous, often non-related households, are inherently cooperative entities. I suggest that the success of these settlements is contingent on good relations within the community, as well as the support of local factions that ensure continued access to labor and material resources. Understanding how these centers form and essentially become the norm in regional settlement patterns therefore requires the examination of patterns of supra-household and supra-community cooperation.

Integrating various aspects of economic game theory with the principles of culture transmission theory, it is possible to conceptualize the emergence of regional centers as a process in which people cooperate in increasingly larger (higher populations per demographically bounded area) and more complex (specialized and hierarchical) political and economic organizations. The processes associated with the formation of regional centers, as evidenced in the archaeological record, must be considered as the “amalgamated behaviors of multiple agents” (Marcus 2008). An evolution of cooperation perspective views people as individuals engaged in strategic and adaptive decision making, as opposed to simply passive agents responding to exogenous factors—climate change, geography—beyond their grasp. Changes in the natural and cultural landscapes are considered as both challenges and opportunities for strategic decision-making by individual agents. Rather than viewing exogenous factors as stressors that force people to adopt new and potentially costly forms of organization, they are seen as circumstances that permit the creation of cooperative organization that were not possible under previous environmental and cultural contexts (Richerson, et al. 2001; Stanish and Levine 2011).

1.4 Project Design

In a general sense, this study assesses the factors that promoted both intra- and inter-community cooperation among the communities of the northern Lake Titicaca Basin during the Formative Period. Specifically, research at the archaeological site of Taraco aimed to chart the social, political, and economic development of the site; such patterns are critical to identifying the strategies used by resident elite to successfully concentrate material wealth and build (and maintain) large political factions. The site of Taraco, located in the far northern Titicaca Basin by the Rámis River, has uninterrupted occupation from the Archaic Period that continues through the present day. The site was a major Formative center with occupation totaling well over 100 hectares. It is therefore an ideal locale to study the processes associated with aggregation and increased cooperation in detail. The site was a prominent Inka town mentioned by Cieza de León, and has been studied by such luminaries as Alfred Kidder II, Luis Lumbreras, Elias Mujica, Manuel Chávez Ballón, Karen Mohr Chávez, and Sergio Chávez. The site is famous for the quantity and quality of its stone stelae, which include the archetypal Yaya-Mama monolith described by Mohr Chávez and Chávez (1975).

Fieldwork at Taraco focused on the excavation of a large artificial terrace located just below the highest part of the modern day town. The additional cleaning of two 35-meter long profiles provided transects of the mound. This work revealed a stratified sequence of depositional layers including architectural fill episodes, midden accumulations, and buildings that were remodeled, disassembled, or destroyed. The earliest three documented occupational phases date to the Formative Period, and the latest of these corresponds with early Pukara.

The excavation data suggest that through strategic participation in long-distance trade networks, early residents accumulated the resources necessary to finance local faction-building

and political expansion. In its earliest phases, Taraco, ideally situated along a number of trade routes, likely functioned as a “transit community” (Bandy 2005), with individual households hosting passing caravans in exchange for presents of exotic goods. Ultimately, residents invested this wealth in public ceremonial activities featuring music and the burning of incense, and in community-sponsored feasts. These events served to build and strengthen alliances among participants; attendees were granted access to exotic goods, and gifts of high-status crafted goods served to materialize social bonds, create indebtedness, and reify hierarchy. In other words, this wealth allowed early residents of Taraco to “buy into” pan-regional ideologies, including the Yaya-Mama religious tradition. During the early Upper Formative, these strategies successfully attracted populations from around the north Basin, and likely beyond.

As Pukara ultimately surpassed Taraco, becoming the sole polity in the region by circa AD 100, these new data also permit a unique opportunity to examine the *evolution* of chiefly authority in the region during the latter part of the Upper Formative. Excavations revealed that a high-status residential sector of Taraco was destroyed in a massive fire in the first century AD. Following this event, economic and political activity in the area declined dramatically. The data strongly suggest that this site-wide burn was an episode of deliberate destruction that represents evidence for intensive raiding. Coincident with this conflagration was the florescence of Pukara, which emerged as an expansive regional polity. These results highlight the critical role of organized conflict in the formation of first-generation states.

1.5 Organization of the dissertation

It is my belief that the developments witnessed at Taraco parallel those that occurred at early political centers across the globe. Following this introduction, Chapter 2 outlines the theoretical

background to this study, and presents a cross-cultural review of aggregated political centers in archaeological perspective. Shared characteristics and key features of regional centers are identified. Information from these other centers allows for the formation of hypotheses for culture change that are testable with archaeological data. Chapter 3 introduces the northern Titicaca Basin, where the site of Taraco is located. This chapter discusses the ecology, culture history, and chronology of the region. Chapter 4 presents a review of early regional centers in the northern and southern Titicaca areas. In this Chapter, I operationalize the concepts outlined in Chapter 2 within the geographical setting discussed in Chapter 3. Chapter 5 introduces the archaeological site of Taraco, and outlines the research design used to test models of cultural evolution at the site. Project objectives and methodology are discussed.

The second part of this dissertation, Chapters 6-10, focuses on the recent research at Taraco. Chapter 6 presents the results of the 2006 and 2007 excavation seasons, and summarizes all of the excavation data, organized by excavation area. Chapters 7 and 8 each discuss the analysis of excavated materials. Chapter 7 focuses on bulk ceramic data and monitors patterns in domestic practice at Taraco over time. While certainly mundane, the everyday activities of food preparation and sharing are critical to the building and maintenance of factions. Chapter 8, examines Taraco's participation in the regional political economy, describing the results of compositional studies of obsidian and finely made ceramics, and tracking patterns of local and long distance exchange over time.

Chapter 9 evaluates the cooperative and competitive strategies that contributed to the emergence, and subsequent demise, of Taraco as a regional center. The data patterns presented in Chapters 6, 7, and 8 are synthesized in order to monitor the site's economic and political development, and identify the means by which Taraco's resident elite enhanced their social

networks. I assess the role of cooperative and competitive leadership strategies in the transforming economic, social, and political landscapes of the Upper Formative Period. Finally, in Chapter 10, the results of the research are Taraco are linked to the theoretical issues addressed in Chapters 2 and 4. Implications of these patterns for the culture history of the northern Titicaca area are discussed, and directions for future avenues of study are proposed.

CHAPTER 2: AGGREGATED POLITICAL CENTERS IN ARCHAEOLOGICAL PERSPECTIVE

2.1 Introduction

In general theoretical terms, the formation of complex societies consists of three processes: complex socio-political systems institutionalize authority over others, that authority evolves through time, and that authority is affected on the ground on subordinate populations. The transition to more complex forms of social and political organization is manifested archaeologically by a reduction in the total number of sites with corporate architecture, the appearance of a principal center, and an increasingly hierarchical settlement pattern (Earle 1987a; Flannery 1976; Stanish 2001b; Wright and Johnson 1975). In the northern Titicaca Basin, these shifts in the settlement pattern define the Middle (ca. 1300-500 B.C.) and Upper (500 B.C.-A.D. 400) Formative Periods, and indicate the adoption of social, political, and economic hierarchies in the area (Stanish 2003). The Middle Formative marks the development of the first economically and politically complex societies in the region, also known as multi-community polities (Bandy and Hastorf 2007), and includes the appearance of the earliest

aggregated political centers in the region. By the Upper Formative, these developments culminate in the construction of the monumental center of Pukara, the largest and most complex political entity to independently arise in the northern Titicaca area. The study of these pre-Pukara centers is an ideal way to monitor changes in the social, economic, and political realms that contributed to the formation of increasingly complex societies. As aggregated political centers are not unique to the Lake Titicaca region, it is likely that the processes associated with their development in the Basin parallel those that occurred in other areas of the world. For this reason, the cross-cultural examination of regional centers is essential for understanding the evolution of complexity in the Titicaca region and elsewhere. In this chapter, I present a cross-cultural review of regional centers in archaeological perspective and use this information to outline hypotheses for their development that are testable with archaeological data.

2.2 Regional centers in cross-cultural perspective

Cross-culturally, aggregated political centers have been referred to by many terms, including multiple mound primary centers (Blitz 1993), primate centers (Stanish 2003), primary centers (Kowalewski 1990), and towns (Schreiber and Lancho Rojas 1995). Such places, often containing evidence of public architecture, ceremonial activities, agricultural intensification, and access to exotic goods, are considered the hallmark of multi-community polities (Adams 1966; Bandy 2001; Bandy and Hastorf 2007). This change in social organization is an important one that represents shifts in risk acceptance and power relations, as well as a move towards greater economic interdependence (Wright 1994).

The aggregation of people into dense populations living in regional political centers is one of the most important transitions in the history of human complex societies. This transition

from small settled villages or larger villages occurred in many areas of the world and represents a shift from the economically and politically egalitarian societies to some kind of ranked chiefly one in which leadership status is differentially held by individuals and groups. This shift is not unilinear or progressive; rather, it is a long and complex process involving numerous peaks and troughs in terms of socio-political complexity (Feinman and Marcus 1998; Flannery and Marcus 2003; Spencer 2003). It is a process characterized by numerous non-state polities spread across a landscape that involves intense forms of interaction where political units frequently rise and fall in a competitive environment.

In village level societies, the nuclear family is the basic unit of residence, production, storage, and consumption. All households are involved in a diverse range of subsistence activities, such as agriculture, hunting, fishing, or gathering. Craft production is highly variable, both among houses and among villages (Drennan 1991; Flannery 1976; Marcus and Flannery 1996). At a regional scale, villages may be affiliated or joined in a network, sharing ritual practices, ideology, or ceramic designs, but very little exists in terms of a site-size hierarchy (Flannery 1976:370). In the south central Andes, villages characterize the Early Formative Period (ca. 2000-1300 BC). Evidence from this period suggests local polities with little regional integration, and no single site can be described as the center of a multi-valley polity (Stanish 2001).

Archaeologically, the transition from villages to regional political centers can be recognized by the appearance of a number of large villages that are substantially larger than neighboring settlements. These centers contain complex “public” or “corporate” architecture that is distinct from domestic residential buildings. As such, they contribute to the development of a hierarchical settlement pattern in the region, which is often characterized by a lattice-like

pattern that is typical of a number of geographical models (Earle 1987a; Marcus 1973, 2008; Stanish 2003). The aggregation of individuals and groups plays a fundamental role in these transitions and in the development of settlement hierarchy (Maynard Smith and Szathmary 1995). Aggregation is an important concept because it results in increased population *density* without implying an *absolute increase* in the number of inhabitants in a region. An increase in population *density* has long been argued to be a precondition of the development of complex social structures (Oberg 1955; Wright and Johnson 1975).

In anthropological terms, regional centers are significant because they introduce a level of supra-community political influence (if not outright control) over smaller settlements in the region (Carneiro 1981; Earle 1987a; Peebles and Kus 1977; Spencer 1998). Their development also involved a number of structural changes in the social, political, and economic spheres; such adjustments were necessary in order to maintain stability and prevent people from “voting with their feet” (Earle 1989), or “fissioning” into two daughter communities (Bandy 2004; Johnson 1982) when the stress of increased population density becomes too great. The emergence of regional centers therefore reflects a reorganization of labor (Arnold 1993, 1996; Steponaitis 1991) and a mobilization of surplus by emergent elites (Drennan 1991; Earle 1987a; Spencer 1998). Surplus may be used to finance a budding political economy and its associated institutions, such as rituals, monuments, long-distance trade, feasting, and craft specialization (Adams 1974; Blanton, et al. 1996; Brumfiel and Earle 1987; Costin 1991; Hagstrum 1985; Klarich 2005). Over time, some of these places will become more successful than their neighbors lacking such features, leading to differential concentrations of resources and power across the region (Renfrew and Cherry 1986). Success is defined as the ability to concentrate material resources into a political center and use it to attain some kind of social power relative to

others in the region. This is exemplified in the northern Titicaca region—out of the many large villages that characterized the landscape during the early part of the Middle Formative, only two of these sites—Taraco and Pukara—became the centers of polities during the Upper Formative.

Empirically, these aggregated political centers have been found to exhibit certain features or engage in certain practices, and it is no coincidence that these characteristics are consistently repeated across space and over time. In turn, these features all share a single important characteristic: they are all examples of cooperative activities involving the coordinated actions of a large number of unrelated individuals. Listed below are some of the most prevalent of these features and practices, along with case studies that highlight their implications for social and political cohesion.

2.2.1 Trade

The ability to participate with regular frequency in long-distance trade networks has many and economic and political benefits, and trade was likely one of the factors responsible for the relatively rapid rise of complex societies in the far northern Titicaca region. While it was not the sole factor, trade has been cited as an important source of social power in southern Titicaca Basin societies (Bandy 2005). Cross-culturally, trade is associated with behaviors critical to increasing complexity, namely alliance building, the concentration of wealth, and the reification of social hierarchies (Blanton, et al. 1996; Clark and Blake 1994; Junker 1999, 2002). Among competing elites, institutional reciprocity inherent in the relationship between trading partners would have critical integrative force in a region, creating obligations and fostering alliances among dispersed contacts (Adams 1974; Malinowski 1961 [1922]; Mauss 1990 [1950]). The importance of trade transcends the physical exchange of material goods. Trade provides the

context in which social relationships are formed and negotiated, and in which aspiring elites compete for prestige.

Junker and Niziolek’s description of the politics of the pre-Hispanic Phillipine chiefdoms during the first millennium AD demonstrates many of these ideas, and emphasizes the formative role of trade—specifically long-distance exchange—in the social, political, and economic development of the region. Summarizing the results of years of research, they argue that,

Powerful political networks were built from locally produced wealth, but especially from the wealth obtained through foreign trade, which was expended through gift-giving and status-enhancing events associated with marriage, war coalition-building, and cementing trade alliances with interior populations controlling export products for Chinese trade. (2010:17-18)

This description highlights an important subtlety of the relationship between trade and sociality. It is clear that exchange of physical objects was not the singular element that bound the often-volatile chiefly networks; alliances among competing groups were also built through marriage, war-coalitions, and public ceremonialism. However, such faction building would have been impossible in the absence of trade and the wealth it provided. Trade underwrote these other activities, providing the financial backing that made possible these social events and showcases of power.

The concept of reciprocal debt obligations, and its implications for social cohesion, is perhaps best illustrated by the case of the *kula* ring, described by Malinowski (1922). Simply, the *kula* was a form of exchange carried out among the communities of the Trobriand Islands. The *kula* ring consisted of a complex of activities, the most important of which was the exchange of two very specific objects: necklaces and armbands. The exchange of these objects was public and ceremonial, and was executed according to a series of definite and complex rules (Malinowski 1920). Malinowski was especially impressed that the *kula*, “rooted in myth, backed

by traditional law, and surrounded by magical rites” (1922:85), did not require an administrator or explicit laws to ensure continuity or adherence to protocol.

In his description of *kula* activities, Malinowski emphasized how the intangible qualities of an object, such as its history, may confer value to an object that transcends its utility. He observed that the red shell necklaces and the *Conus millepunctatus* armbands exchanged in the *kula* ring had no real use, yet they were highly valuable commodities. Often, the armbands were too small to be worn even by children, or were so large—and valuable—that their size made them unwieldy and impossible to carry (Malinowski 1922). Ultimately, Malinowski concluded that wearing the necklaces and armbands are not the objective of ownership. Rather, these objects were ceremonial, and it was not the usefulness of the object, but the *history of the object* that gave it value. *Kula* goods were precious because they had a history, having passed through a number of hands. Although these necklaces and armbands had little utility in the classic sense of the concept, they were nevertheless a symbol of wealth and prestige. Such a system of value prevented the exchange of fake armbands or necklaces, which would have lacked both a recognizable name and history. In the absence of these features, the object had no value. Moreover, because *kula* goods were always exchanged among the same partners, a fake item could not be traded, as the bearer would lack a prescribed trading partner.

The *kula* ring, a highly ordered system of exchange, bound individuals and groups together through reciprocal obligations, presented opportunities for individuals to accrue prestige, and promoted engagement in other utilitarian activities, including building canoes, setting dates for important events, and secondary trade. While certainly all of these phenomena can be found in areas where the *kula* did not exist, where it did occur, the *kula* governed many other activities. The trading partnerships of the *kula* ring effectively translated to lifelong

relationships that implied mutual duties and privileges. In the aggregate, these individual relationships created and maintained a large, inter-tribal network. Although it was not Malinowski's goal to identify factors that may contribute to social change in the long or short-term, he succeeds in explaining the stability of the Trobriand social system, which was characterized by highly pronounced social differentiation that persisted despite an absence of a central administration or coercion.

Another important consideration is the distinction between long-distance and local networks of trade and exchange. Marcus' (1983) distinction of intra-regional, interregional, and long-distance exchange remains a powerful way to conceptualize the economic relationships in a complex political landscape. In the anthropological literature, there is consistent emphasis on the acquisition of goods from a distance (Adams 1974). Long-distance trade is generally focused on high-valued and rare commodities. Bulk, low value domestic items are rarely imported from long-distances.

Long distance exchange networks provide economic links between independent settlement systems (Johnson 1975) and are part of the cooperative strategies seen in nonstate contexts. Local trade provides economic links within settlement systems. Through a series of local transactions, for example, individuals may obtain exotic or imported goods, even if they themselves lack faraway contacts. In general, transactions at the local level are motivated by the need for everyday items, and through this exchange, ordinary goods take on a symbolic value. In local trade, goods become the physical manifestation of social bonds, and are ways for individuals to declare their affiliation or advertise their group identity. The value of the social bonds created through the local exchange of everyday items (even objects that communities can

produce themselves) cannot be understated, particularly when political structures are weak (Smith 1997:42).

2.2.2 Specialization

Specialized labor has traditionally been considered a “defining characteristic of complex societies, where it has been identified as an integrating mechanism” (Russell, et al. 1998:65; see also Flannery 1972). Due to the restricted breadth of products manufactured by a single specialist or group of specialists, this system compels some degree of inter-household exchange, through which consumers may acquire goods and materials that they do not produce themselves (Arnold 1995; Costin and Hagstrum 1995; Earle 1987b). Specialization therefore represents an important example of cooperative labor efforts and the creation of economies of scale.

Specialization, which may be understood as a reduction in the number of productive activities in which an individual (person or household, depending on the given unit of production) is involved, allows for the production of surplus without the addition of labor hours (Haines, et al. 2004; Hirth 2009). In a specialized system, people do not work more—they work differently. Sometimes, a managerial position may be required in order for a specialized system to function successfully. The appearance of these positions, which may include managerial elite or a priestly class, is one of the features that mark the transition to a hierarchical settlement system with an aggregated political center. Furthermore, the development of a specialized economy implies increasing inequality or heterogeneity among non-elite (Klarich 2005:26), another important characteristic of increasingly complex forms of social organization.

Drennan (1991) notes the existence of craft specialization fairly early in the occupational sequence in the Valley of Oaxaca. In this example, specialization occurred at the household

level. This marks an important departure from popular theories of chiefdom development, in which villages, rather than households, are at least part-time specialists. In the Valley of Oaxaca, in contrast, each village had the specialists that it required, and specialization at the village level did not occur until very late in sequence of chiefdom development. Drennan suggests that such economic organization may have actually stimulated, rather than hindered (as the popular theories he cites might imply), the aggregation of populations within the region. He argues that proximity to specialists would pose a significant advantage to residents, and could explain the existence of large communities such as San José Mogote. Moreover, specialization within villages would also encourage the development of nucleated settlements (Drennan 1991:282).

2.2.3 Monuments

The construction of monuments, often built with cooperative, surplus-funded labor, serves several important social functions. The grandest monuments are erected only in a primary center; villages or communities associated with the principal center may also have monumental architecture, but it will not approach the scale of the architecture of the regional center. The process of their construction unites individuals and groups in a single cause. Once built, monuments represent surplus wealth, access to labor, and the power to direct labor. Along these lines, Drennan (1991) suggests that the scale of public works “is certainly one measure of the extent to which leaders can control the expenditure of human effort” (1991:282-283). They are the materialization of elite ideology (DeMarrais, et al. 1996) and legitimize systems of inequality and control (Earle 1990). As such, they figure prominently in the political economy of the chiefly society.

A good example of the important role of monuments can be found among the societies of Neolithic Wessex, located in southern England. In this region, the early Neolithic is associated with three forms of monumental construction: barrows, causewayed camps, and later, cursus monuments. The construction of these various monuments suggests significant control over labor, and their distribution points to a hierarchical settlement system. Together, these features are consistent with the political landscape of multiple competing regional chiefdoms (Earle 1991b:89). Earle (1991b) argues that, in this case study, “the tremendous investment of labor in ceremonial architecture can be seen as a means to ground the ideology in a physical reality owned and controlled by the chiefs” (Earle 1991b: 98). The construction of monuments created a new demarcated landscape that was associated with different corporate groups. These monuments essentially materialized the relationships between people and emerging corporate groups, and advertised ownership over local pastoral lands. Through the altered landscape, which represented significant changes in the system of land tenure, monuments became a form of “symbolic capital,” reinforcing chiefly control over labor, and effectively changing the way that labor could be controlled (Earle 1991b).

2.2.4 Rituals

Rituals represent a final important element of intermediate societies, and aggregated political centers often serve as the venue for region-wide ceremonies and special events. Like monuments, rituals serve to unite unrelated individuals, and promote solidarity among non-kin (Durkheim 1995). Durkheim argued specifically for the importance of ideological systems, consisting of a suite of rites and beliefs, for the integration of individuals and protection of the social order. He suggested that the periodic rituals and social gatherings serve to build and

recharge feelings of common identity and community. These rituals and rites must be held at regular intervals in order to maintain and strengthen the collective feelings and ideas that serve as the infrastructure to any society. Without ritual, he argued, the sense of community is lost (Durkheim 1995).

Cross-culturally, rituals reaffirm the position and office of the leaders, and also serve to foster relationships among social strata. Periodic rituals and ceremonies represent contests for the extensive mobilization of goods by the elite. Feasting and other supra-household food sharing events are forms of rituals that provide a setting for social integration and status competition (Prentiss and Kuijt 2004; Trospen 2002). The sharing of a large meal provides simultaneous opportunities for building social unity and exercising personal ambition. These events, sponsored by the elite and financed through food surpluses, are an inclusive social strategy used to extend alliances among elites and communities, reinforce obligations, and promote prestige (Blitz 1993). Among elites, competitive feasting could promote the prestige of a single individual, while collective, community-sponsored events might signify the economic prowess of that community over neighboring villages, who may or may not choose to participate (always at a cost). Not surprisingly, these objectives are similar to those associated with long-distance trade and monument-building.

The *makahiki* ceremony of the Hawaiian Islands illustrates all of the processes associated with institutional ritual. The *makahiki* was the major agricultural festival in Hawaii, and was a ceremony of taxation that coincided with the period of winter storms, which made the seas to dangerous for fishing. Specifically, it celebrated the god Lono, winter rains, peace, and unification (Peebles and Kus 1977). *Konohiki*, local landlords who were agents of the chief, performed “necessary agricultural rites” and collected taxes in the form of offerings to Lono. If

these offerings—which included mainly raw materials and commodities used by the elites, as well as some perishable foodstuffs enjoyed by the paramount chief (Earle 1977)—appraised as “sufficient” and “acceptable,” the taboo placed on the lands and the products of the locality would be removed (Peebles and Kus 1977).

It is quite clear that the *makahiki* served to extract resources to finance elite activities. It also validated the office of the paramount chief and his agents, who had the power to accept or reject the gifts to Lono, and, by extension, power over the land and its resident populations. The *makahiki* was also one of the few occasions when the paramount chief, the physical representation of Lono, would visit the various localities (*ahupua'a*) in his jurisdiction:

In his role as the representative of Lono, the paramount chief visit each district and each *ahupua'a* in his domain twice during the Makihiki. From the quantity and quality of the taxes, gifts, and social interaction associated with the festival he could assess first-hand the disposition of the chiefs and managers in their roles as his representatives, judge the productivity of the several areas, and assess the ability, strength, and desire of the population to either wage war at his direction or to make a revolution against him. (Peebles and Kus 1977:426)

It is important to note that the *makahiki* was one of the few instances that brought the paramount chief together with the commoners in his domain. Face-to-face contact between the commoners and the leaders gave the festival both social and political, in addition to economic, relevance. It was not simply the paramount chief visited the communities, but that he was the physical manifestation of Lono. The commoners were afforded interaction with the god's representative, and this was a likely powerful motivator to comply with his demands. During the *makahiki*, Lono was no longer an abstract entity, but a real, tangible force with the power to place and remove taboos on local lands.

2.3 An evolutionary framework for the development of regional centers

In this dissertation I employ a contemporary evolutionary approach in order to understand the origins and development of aggregated political centers in the northern Titicaca area. The changes in the nature of principal centers directly reflect processes of increasing social, political, and economic complexity. The evolution of complex societies has long been a topic of anthropological research. The first systematic ethnographies described so-called “primitive” societies (Firth 1957; Malinowski 1961 [1922]; Radcliffe-Brown 1948; Sahlins 1958, to name a few) that were qualitatively different from “modern” society. Anthropologists devoted attention to explaining the positions of these societies in the trajectory human sociality (Service 1962), and discussing possible mechanisms of culture change (Malinowski 1945; Steward 1939, 1955; White 1943, 1959). Boas and his students (Benedict 1948; Boas 1987 [1940]) argued that similar cultural phenomena were the product of “convergent,” yet historically unique, developmental trajectories, rather than “the uniform history of their development” (Boas 1987 [1940]:73).

Scholars outside of the Boasian school found this particularist view problematic, however, because it was an express denial of cultural patterns and regularities that were empirically observable. Advocates of the comparative approach argued that anthropology should distill similarities and processes that are independently repeated in cultural sequences, so as to recognize trends in temporal and functional relationships (Steward 1949). Early models of cultural evolution (Steward 1955; White 1943, 1959) suggested cause and effect relationships as a means for understanding the common features of human society across space and time. Childe and White proposed theories of unilinear evolution and emphasized that all human communities could potentially achieve more complex forms of social organization through the accumulation

of technical knowledge, or culture. Steward, in an attempt to resolve the excessive abstraction of Childe and White's approach, proposed a multilineal scheme for cultural evolution, advocating for the analysis of local histories within the context of the grand scheme of social evolution, tracing human societies from small scale to complex (Steward 1955). More recently, the comparative approach of scholars such as Johnson and Earle (Johnson and Earle 2000) posits the general conclusion that population growth, coupled with a chain reaction of economic and social changes, underlies sociocultural evolution.

An evolutionary approach is appropriate for this analysis because, as outlined above, regional population centers are a universal feature of human societies and share many important characteristics. It is likely that similar processes led to this development, despite superficial cultural differences and temporal distance. The process of diffusion alone cannot explain the appearance of aggregated political centers and multi-community polities in independent and far-flung areas across the globe. Understanding how and why these places emerge and develop requires a theoretical framework capable of explaining changes in the behavior of individuals. In the aggregate, these individual decisions produced the large-scale social, political, and economic patterns that are observable in the archaeological record.

The theoretical approach used here is anchored in culture transmission theory (Boyd and Richerson's Dual Inheritance framework [Boyd and Richerson 1985, 2005; Richerson and Boyd 2005] and Durham's model of Coevolution [Durham 1991]). In contrast to earlier theoretical models, culture transmission theory offers a *mechanism* for culture change, and as such, is a powerful tool for understanding the emergence of complex societies. Within this framework, "culture" is learned information that guides the behavior of individuals. Cultural evolution relies on the process of cultural selection, the "process by which particular socially learned beliefs, or

pieces of knowledge, increase or decrease in frequency due to being adopted by other individuals at different rates” (Laland and Brown 2002:250). The transmission of cultural information occurs when two brains interact, and does not follow the processes of biological evolution, in which individuals receive all of their phenotypic information from their genetic contributors. Unlike natural selection, the presence or absence of cultural traits does not necessarily rely on differential survival or reproductive rates of individuals possessing that knowledge, but rather on social interaction, which permits exposure to new information. In this process of “cultural selection” individuals may receive information from their parents; however, people may also be exposed to new ideas via interaction with peers, siblings, teachers, and friends.

Cultural selection, which sometimes leads to cultural evolution (Boyd and Richerson 2005:Chapter 3), is a Darwinian process dependent on human decision-making. For every behavior there may exist an infinite number of variants. Differential rates of transmission for variants result from cumulative individual acceptance—or rejection—or certain types of new information. Many factors can affect human decision-making, and there exists a spectrum of decision-making possibilities. At one end, humans have free choice to adopt whatever behavior they choose, a scenario that Durham refers to as “selection by choice,” or simply “choice,” and this results in the preservation of certain cultural units through “free decision making by individuals or groups” (1991:198). However, empirical research shows that individuals’ choice of which variant to accept is not random, and in fact, individuals are not always free to accept any variant. Durham, for example, describes “imposition,” in which cultural information is preserved because individuals must comply with the decisions of others (1991:198). More often than not, cultural selection has elements of both choice and imposition.

But how do people decide which behavior they will adopt? Cavalli-Sforza and Feldman (1981) observed that, when given free choice between two alternative behavioral patterns, individuals might be more likely to adopt one over the other. Likewise, Boyd and Richerson describe “biased cultural transmission,” in which individuals, given free choice, preferentially select one variant over another (Boyd and Richerson 1985, 2005; Richerson and Boyd 2005; Spencer 1993). A bias towards certain variants may result from a genetic predisposition to favor certain forms of information. Boyd and Richerson refer to these gene-based inclinations as “direct bias.” Preference for certain variants may also be frequency-dependent, such that the proportion of people in a population who have—or conversely, do not have—a trait will affect the probability or likelihood of transmission (Boyd and Richerson 1985, 2005). It has also been demonstrated that people tend to imitate the behavior of a majority (Boyd and Richerson 1985; Henrich and Boyd 1998), or of successful or prestigious individuals (Henrich and Gil-White 2001).

Durham suggests that human decision making processes are guided by “primary” and “secondary” values. This system of values aids individuals in their decision-making by providing them “with the ability to make decisions based upon actual experience with the consequences of different options” (Durham 1991:200). This idea assumes that people can perceive the consequences of their actions, and can evaluate the outcomes of different options before making a choice. The system also “provides them with the ability to pretest different options by anticipating their effects in a ‘symbolic model of the problem environment’” (Durham 1991:200). Primary values are related to individual fitness, and refer to feedback that is intrinsically good or bad, according to the senses. They develop through natural selection and do not require social transmission—they are a product of the interaction between the nervous

system and the environment (Durham 1991). Secondary values are based on collective experience and social history, and are dependent on social transmission. These values, which include proverbs, traditions, social conventions, habits, moral principles, and so forth, form an important part of local cultural systems, and often have their own cultural evolutionary histories (Durham 1991; Laland and Brown 2002). They are extremely powerful forces that are capable of producing observable cultural changes.

2.4 Models for the emergence of aggregated political centers

This analysis considers an important example of cultural evolution from the northern Titicaca area—the transition from dispersed villages to multi-community polities. Investigation of this multi-century event requires analysis of the factors that might influence the decisions made by individuals—or groups of individuals—that promoted the large-scale adoption of alternative behavioral patterns that favored cooperation and interdependence over political autonomy. Acceptance of new forms of cultural information during the Formative period promoted the aggregation of regional populations and the formation of increasingly complex forms of social organization that are observable in the archaeological record.

2.4.1 Factors influencing human cooperation

This study is an empirical and theoretical analysis of the emergence and development of regional centers in the northern Titicaca area, processes that may be understood within the framework of cultural transmission theory. Such an evolutionary perspective allows for investigation of the factors that contributed to shifts in regional settlement patterns. This powerful framework can

also help to explain why people chose to relinquish some measure of autonomy to participate in large social networks, live in aggregated political centers, and engage in cooperative activities such as trade, public ritual, and monument building, and even potentially harmful behaviors such as conflict and violence.

An impressive body of empirical evidence suggests that complex polities develop in a competitive environment, the basis of the rise-and-fall dynamic of these contexts (Marcus 1998; Redmond and Spencer 2006). However, a competitive landscape does not necessarily imply that each village or group is fighting each other all of the time. Conflict, is, in fact, quite costly, and a competitive landscape actually fosters higher levels of cooperation among peoples and groups in any area. Intensive within-group cooperation is necessary for defense, war, economic production, trade, and so forth.

The key here is how “the group” is constituted. One way to look at alliances in a competitive, non-state landscape is to view them as forms of regional cooperation vis á vis other groups. An important development in chiefly societies is that alliances form between kin and non-kin alike (Mathew and Boyd 2011), creating mutually supportive political relationships across a wide geographic area. Relationships can be sustained in a variety of ways, including exchange, shared religious traditions, shared political relationships, and the like. The larger the alliance, the more people are included within the cooperative group. The larger the group, the greater is their ability to concentrate resources and compete with other groups. Cooperation and competition are not mutually exclusive categories of human behavior. Rather, they represent a continuum of strategies by individuals and groups to prosper in a competitive environment. The cycles of chiefly politics are in effect driven by the oscillating alliances in any political system, particularly in stateless societies.

Aggregated political centers are essentially cooperative entities, and, as such, they have important economic and political advantages over potential competitors. Understanding them in this way directs us to a large body of literature dealing with the evolution of human cooperation. In general, studies of human cooperation have recognized that patterns of human cooperation are extensive and diverse, and characterized by a number of features (Boyd, et al. 2005:252). Cross-culturally, people consistently violate the canonical assumption of classical economics that individuals are entirely self-interested. Behavioral experiments have shown that people care about fairness and reciprocity, and are often willing to sustain a personal cost in order to change the distribution of material outcomes or punish those who do not cooperate (Henrich, et al. 2001). However, human cooperation is contingent on a number of factors, not everyone cooperates. Preferences for economic choices are shaped by everyday experiences, and, more specifically, by institutions (Boyd, et al. 2005), and by economic and social interactions (Henrich and Smith 2004). Even within the same environmental or cultural conditions, it can be seen that individuals' willingness to cooperate with others—even among close kin—is variable. Importantly, though, research has demonstrated that individual-level variables such as age, wealth, sex, household size, and risk preference do not account for significant variation within or across social groups (Henrich, et al. 2001; Henrich and Smith 2004).

A review of the literature suggests that any number of factors could potentially influence an individual to decide to cooperate with others. The cross-cultural application of the Ultimatum Game by Henrich et al. (2001) even suggests to a degree that some of these factors may be culturally specific. Notwithstanding this variation, the general trend is that overall, the vast majority will involve some form of perceived payoff to the cooperator (Boyd, et al. 2005; Stanish and Haley 2005). A “payoff” could potentially take any number of forms, and could be

either material—such as access to limited or restricted resources—or intangible—such as prestige or status (Clark and Blake 1994; Hayden 1998; Junker 1993; Plourde 2006). Scholars have also demonstrated that the *promise* or *expectation* of prestige and the opportunity to accrue status represent powerful payoffs that motivate humans to engage in cooperative, altruistic, and even costly behaviors (Henrich and Gil-White 2001). In a less positive vein, the penalties for noncooperation, including the threat of punishment or other sanctions, can also pose effective incentives to cooperate. In fact, the punishment of “free riders” has been cited as the underlying factor responsible for sustaining large-scale cooperation in certain prestate contexts (Mathew and Boyd 2011).

Assuming that humans are contingent cooperators, and that the willingness to cooperate is variable, it is possible to assess some of the factors capable of influencing individual and group decision-making that have been discussed by previous studies. The factors discussed below have long been cited as responsible for the types of organizational transformations that characterize the emergence of aggregated political centers, and the transition to multi-community polities, as outlined above. Of course, in reality, no single factor is completely responsible for the rise of complex societies; however, these factors can be considered in a schematic sense, so as to understand their potential impact on social systems. Essentially, they help us understand why individuals may collectively opt out of conventional activity patterns in favor of a new, different, and potentially risky—or even dangerous—behavioral strategy.

2.4.1.1 Coercive dominance

Little imagination is required to understand how violence—or the threat of violence—can motivate individuals to cooperate with one another. For decades, scholars have argued that

command backed up by force, is the factor that promotes the aggregation of populations and the development of hierarchical settlement patterns (Boyd, et al. 2005). When others suggested that individual aggrandizement was the force behind increasing social complexity, Carneiro succinctly argued that “force, not enlightened self interest, is the mechanism by which political evolution has led, step by step, from autonomous villages to the state” (Carneiro 1970:734). Others shared this view, suggesting that conflict may be seen as a “motivator for cooperation and an eliminator or subjugator of less effective organizations” (Wright 1977:380). In the strict sense of a “coercive” model of increasing social complexity, people are directly forced, by threat of physical violence, to cooperate with the demands of others. Circumscription theory (Carneiro 1970) argues that conquest warfare, spurred by acute land shortages, is the principal avenue for political transformations. Land shortages, a consequence of population increase in circumscribed areas, result in stress, competition, and, ultimately, intergroup warfare (Carneiro 1988; Earle 1997; Larson 1972). Conquest and subjugation of neighboring groups could result in the acquisition of needed territory, thereby alleviating the stress brought on by land shortages, as well as the growth of a large subordinate population. Prisoners taken in war can provide an important source of labor, required for the construction of monuments and other public works and infrastructural projects, leading to the formation of a new, lower, class of residents (Carneiro 1970, 1981). Leaders might also use force, or the threat of violence, to exact tribute, in the form of goods or corveé labor, from subjugated populations, resulting in a centralization of prestige objects, surplus goods, and labor (Arnold 1996; Carneiro 1981).

From an evolution of cooperation perspective, it is also possible to model the existence of conflict in nonstate political landscapes in the absence of bellicose elite or resource stress. In a context of sufficiently high regional population densities, conflict emerges as a viable strategy

for highly cooperative groups to acquire more resources and protect themselves against potential adversaries. In effect, organized intergroup conflict is a type of *within-group* cooperation, albeit a form of behavior that is used in a decidedly non-cooperative manner *against* other groups.

Groups that can successfully organize themselves to raid others will acquire external resources and, in the long run, will be at a selective advantage against groups that are less well organized.

However, obvious and outright force is not the only manner in which coercion could figure into elite political strategy. A slightly weaker interpretation of the coercive dominance model posits that the cost of non-cooperation may be unbearable (Johnson and Earle 2000), such that people may *feel* forced to comply with the demands of others, despite an absence of direct violence or physical threats. This idea is consistent with Carneiro's notion of circumscription as originally articulated in 1970. Circumscription, wrought by any number of myriad conditions, limits the opportunities available to a population. In limiting the options available, the cost of refusal is increased (see discussion in Earle 1991a).

The concept of "structural violence" (Galtung 1969), often cited in the field of cultural anthropology (see Farmer 1992), is helpful for understanding this idea. "Structural violence" suggests that empirically observed consequences—including death, pain, or manipulation—cannot be causally linked with any individual or group action. Rather, these outcomes result from unequal access to resources and opportunities:

But whereas in the first case these consequences can be traced back to concrete persons as actors, in the second case this is no longer meaningful. There may not be any person who directly harms another person in the structure. The violence is built into the structure and shows up as unequal power and consequently as unequal life chances...Above all the *power to decide over the distribution of resources* is unevenly distributed...The important point here is that if people are starving when this is objectively avoidable, then violence is committed, regardless of whether there is a clear subject-action-object relation, as during a siege yesterday or no such clear relation, as in the way world economic relations are organized today. (Galtung 1969:170-171)

Although Galtung describes this concept in terms of the modern economy, its theme is clearly relevant to studies of early social complexity. Among competing polities, structural violence may be manifest in one community's ability to limit another's access to essential resources, curtailing any opportunity for growth, and thereby forcing compliance. While centers may not directly threaten their neighbors with violence, the political and economic landscape may have been structured such that non-participants had little chance for survival. Such a scenario may repeatedly occur within the center itself among members of the resident population. For example, leaders might offer protection against external threats of violence, but were not actually violent themselves. Alternatively, if leaders manage the economy to the advantage of participants, their absolute control over strategic resources, including water, arable land, or trade routes, may motivate others to cooperate with their demands (Johnson and Earle 2000). In the end, the benefits of participation in a regional political economy—which might come at the cost of political or economic subordination—outweigh the benefits of autonomy.

Evidence for different types of conflict and violence can be identified in the archaeological record, and falls into two categories: direct and indirect (LeBlanc 1999). Direct evidence of violence includes the physical results of conflict or force, while indirect evidence suggests violence without indication that it actually occurred. Evidence of “deliberate” destruction (Marcus and Flannery 1996:123, 129-130), headless burials and trophy heads, as well as healed or perimortem fractures, or multiple and/or improper burials, fall under the umbrella of direct evidence for violent activities (LeBlanc and Register 2003). Indirect evidence is a much broader category that includes symbolic suggestions of violent or forceful behavior, such as images of trophy heads, weapons, or battles, as well as defensive walls and fortifications, which imply protection against external threats (Peebles and Kus 1977; Steponaitis 1991). As has been

argued for Moundville (Peebles and Kus 1977), high status burials interred with weapons, iconographic depictions of violence, or decapitated individuals, could indicate that violence figured prominently in elite political strategy. Violent icons and other frightening images may be a way to motivate cooperation without doing actual physical harm. Evidence in support of structural violence would be far more subtle and circumstantial, and would require indication that leaders were limiting access to critical or strategic resources in some way.

The site of San José Mogote, the major population center in the Valley of Oaxaca prior to the emergence of Monte Albán, is an excellent case highlighting both direct and indirect evidence for violence. In the Rosario phase, San José Mogote was the center of a complex chiefly society, occupying the highest tier of a three level site-size hierarchy (Marcus and Flannery 1996:123). A temple excavated at Structure 28 at the site was found to be the locus of a burn so intense that it vitrified pieces of the clay daub used in construction. Although burning of floors was a common practice, this fire was qualitatively different from the others, and it was determined unlikely that such a fire was accidental. Rather, Marcus and Flannery cite this temple as evidence for raiding, which, though uncommon in the Rosario phase, became more widespread in subsequent periods (Marcus and Flannery 1996).

A second example demonstrates indirect evidence for violence. Monument 3, a slab in the threshold of a corridor entrance depicts a mutilated captive:

The carving depicts a naked man, sprawled awkwardly on his back, mouth open and eyes closed. A complex scroll motif shows us where his chest had been opened to remove his heart during sacrifice. A ribbon-like stream of blood extends from this scroll to the border of the monument, ending in two motifs that wrap around the edge of the slab. These two motifs, each made of a circle and triangle, are stylized drops of blood. In later periods, the same motif would be carved on the stairways of temples where sacrifices were performed. (Marcus and Flannery 1996:129-130)

Marcus and Flannery also note the irony of the slab's location; it was placed in a doorway where

the figure would be literally “stepped on.” They suggest that Monument 3, coupled with the burning of Structure 28, represents the earliest indications of violent political strategies in Oaxaca; a pattern of raiding, temple burning, and capture of enemies that would later be used to enhance the political power of the Zapotec elite (Marcus and Flannery 1996). In the Zapotec state, centered at the monumental site of Monte Albán, intimidation and physical violence were used to force cooperation and limit interest in dissent.

2.4.1.2 Environmental perturbations

Earle cites two environmental conditions that would affect the development of complex societies: conditions that permit the generation of surplus, and conditions that limit people’s options, such that any surplus would be generated towards a center (Earle 1989:86). Changes in environmental conditions resulting in poor productivity may motivate cooperation with leaders, who manage risk and promise relief from resource stress through redistribution and a division of labor (Flannery 1972). Arnold identifies stress among the possible “forces which were powerful enough to stimulate a reorganization of labor, involving the partial domestic control over labor and products, increased per capita labor investment, and divertible surpluses” (Arnold 1993:86). Climatic instability—an unpredictable sequence of good and bad seasons—can also promote the adoption of cooperative behavioral strategies as a way to manage resource uncertainty (Kennett and Kennett 2000). Furthermore, it is likely that areas within a region are differentially affected by general climate change, and, as a result, populations aggregate in areas with abundant resources. Sharing food and creating exchange networks allows groups to balance food abundances and shortages. In this case, cooperation with the demands of others may ensure a constant and reliable supply of food, and increase social prestige through access to limited

resources. These social bonds, created in response to climate change, ultimately become materialized in “region-wide symbols of wealth and power” (Lepofsky, et al. 2005:282).

It is important to emphasize that resource stress is not the sole avenue by which the natural environment may influence human behavior. Environmental changes resulting in surplus yields can also be responsible for aggregation (Hayden 1995). In a situation where resource conditions are consistently abundant, the cost of participating in a center’s political economy is so low that it is easily outweighed by even minor benefits. Moreover, less time would be required to perform subsistence-related tasks, resulting in surplus labor and time, which, under appropriate conditions, could be redirected towards specialized or system-serving activities (Arnold 1996; Earle 1989; Hayden 1995). Mobilization of surplus for cooperative labor activities or supra-household food sharing converts perishable resources into prestige, which may be used to demonstrate power, extend alliances, and reinforce obligations (Blitz 1993; Hayden 1998).

As an illustration of one component of this model, Algaze (2001) attributes the development of complex civilizations in Mesopotamia during the Uruk period to environmental conditions that promoted surplus production while facilitating economic activities. In this example, southern Mesopotamia had preferential access to resources, which, over time, fostered a cooperative social network among resident populations. A higher concentration of resources in the Tigris-Euphrates alluvial lowlands relative to other areas in southwestern Asia offered the residents of southern Mesopotamia a denser and more varied concentration of resources, as well as higher and more reliable agricultural yields. As a result, “Uruk elites could therefore extract relatively larger surpluses per unit of labor than their contemporary counterparts in the north” (Algaze 2001:204). Their strategic location along the river fostered an efficient distribution

system based on water transport. Algaze argues that together, these conditions resulted in high levels of social and economic differentiation, as well as an aggregation of local populations (Algaze 2001). The adoption of cooperative strategies would have enabled aspiring elite to extract more resources, maximize revenue, and extend their power. The unique geography presented by the region lowered the cost of cooperation to practically nothing for participants, for whom benefits might have included status—gained through the association with the rich and powerful—or participation in food-sharing events.

Kennett and Kennett (2000) provide an example of cooperation motivated by a contrasting suite of environmental conditions. In their case study from the Channel Islands, the combination of climatic variability, sustained terrestrial drought, and high marine productivity can be linked to the emergence of large, sedentary settlements in the region. These conditions prompted the adoption of competitive and cooperative strategies for managing resource stress. Over time, cooperative strategies, including sedentism, an increased reliance of fishing during drought (i.e. terrestrially unproductive) periods, and trade, became the dominant form of social organization within the islands. Kennett and Kennett maintain that a violence-based model, predicated on competition for limited resources, cannot explain why sedentary societies appeared in the Channel Islands, because terrestrial behavior and decreased settlement mobility (without cooperative activities like trade) would have magnified resource stress for some of the communities.

In order to avoid the naïve determinism of a purely environmental approach, establishing a causal relationship between environmental perturbations and cultural change requires “demonstrating why people responded to particular environmental shifts” (Lepofsky, et al. 2005:268). Geological evidence for climate change alone does not necessarily mean that

environmental perturbations were responsible for aggregation (deMenocal 2001; Lepofsky, et al. 2005). Support for such a model relies on several lines of evidence that, together, link the archaeological record *and* demonstrate a cultural response to climate change. In their case study, Kennett and Kennett utilized isotopic data extracted from ichthyofaunal remains recovered in radiocarbon-dated stratigraphic contexts. Such high-resolution climate data can map local climate onto general regional trends—identified in the geological record—and can help identify the environmental fluctuations that could have influenced human behavior. This type of data, together with evidence for supra-household cooking and storage, or an abundance of serving vessels used in feasting (Blitz 1993), would likely indicate large-scale redistribution of surplus—a cooperative response to environmental stress.

2.4.1.3 Ideology

The development of collective ideologies is one of the processes involved in the consolidation of people in a geographic area. Ideologies are important because, in evolutionary terms, they counter ego-directed behavior and shift it towards more cooperative ones. It is likely that early regional centers may have served as a religious center that controlled the production and distribution of ideology through rituals, feasts, and supernatural imagery. Much like the oracle at Delphi, such places would have been pilgrimage centers that would have attracted followers by promising access to restricted knowledge and symbolic icons. Participation in ceremonies and the acquisition of associated symbolic objects conferred prestige, but would have required visitors to cooperate with the demands of the resident elite. Possible costs of cooperation with leaders include various types of payments, perhaps rare or exotic goods, as well as willful subordination or the contribution of labor hours. In such a scenario, the payoff of cooperation

would be prestige—signaled (Plourde 2006) by newly acquired symbolic materials and ritual knowledge—which could be parlayed into power strategies (Blanton, et al. 1996) in their nascent communities. The promise of prestige and status would lure individuals into long term reciprocal debt obligations (Hayden 1998), thereby establishing a large coalition of supporters (Clark and Blake 1994). The influx of supporters would, in turn, provide the center with access to a large pool of labor and concentrate a diversity of exotics. As in the case of the *kula*, it is likely that any ceremonial exchange of objects would have been accompanied by subsidiary trade in important, yet perhaps not ritually valuable, commodities. Such a model, in which people are “convinced,” rather than “coerced,” to participate, would theoretically allow for the formation of regional centers with a large and willing labor force, supra-household production, and the exchange of exotic and utilitarian goods.

CHAPTER 3: THE NORTHERN LAKE TITICACA BASIN—ECOLOGY AND HISTORY

3.1 Introduction

The circum-Titicaca region, located in the south central Andes, is a large geological basin situated between two mountain ranges—the Cordillera Blanca and the Cordillera Real—spanning the modern political border between southern Peru and northern Bolivia. The Titicaca basin is comprised of two sub-basins—the larger and deeper Lago Chucuito (also called the Lago Grande) and the smaller and shallower Lago Huiñamarca (also called the Lago Menor)—which are joined at the Strait of Tiquina (D'Agostino, et al. 2002; Grove, et al. 2003; Tapia, et al. 2003). The slightly saline lake covers about 8,500 km² (Boulangé and Aquize Jean 1981), but the total hydrological drainage covers over 57,000 km² (D'Agostino, et al. 2002). Although technically classified as an intertropical climatic zone, the basin's high altitude (the region's lowest point is the surface of the lake itself, which sits at 3,810 m.a.s.l.) produces a general environment that is cold, windy, and stark. That is not to say that this region, known as the *altiplano*, is inhospitable; on the contrary, the Titicaca region is an extremely productive agricultural zone that is well-

suited to the cultivation of tubers, especially varieties of potato, oca, and ullucu, chenopods such as quinoa (*Chenopodium quinoa*) and *quañiwa*, and legumes, such as *habas* (*Vicia faba*). Climatically sensitive crops such as maize, which normally cannot be grown above 3,600 m (Seltzer and Hastorf 1990), can occasionally be grown near the lake edge under special environmental conditions (Stanish 2003:62-63). Pastoralism—specifically, the herding of domestic camelids (llamas and alpacas)—and fishing are also essential components of the subsistence economy (Stanish 2003). These favorable conditions, together with demographic circumscription, allowed the Titicaca region to become one of the few areas in the world in which complex societies independently arose.

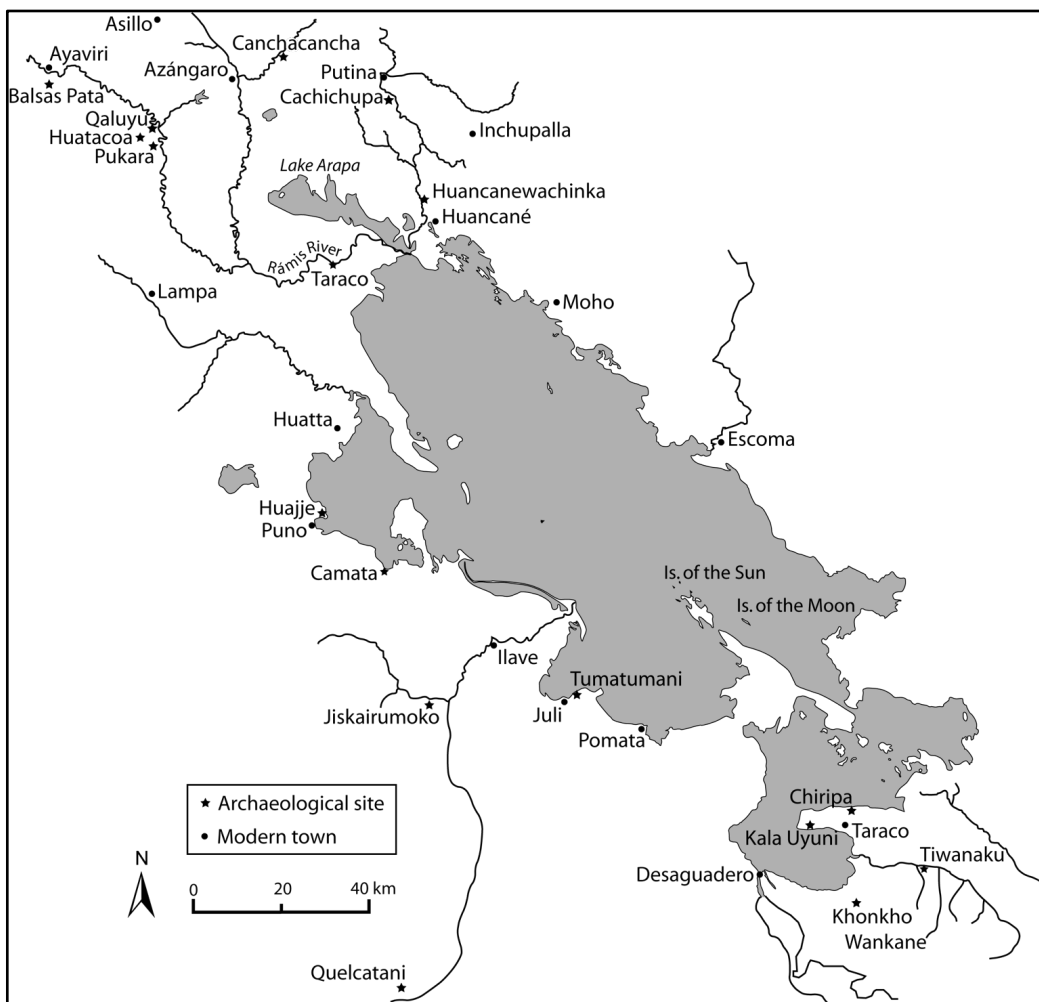


Figure 3.1. The Lake Titicaca Basin, showing sites mentioned in the text

3.2 Ecological history of the Titicaca region

The cultural developments of the Titicaca Basin played out against the backdrop of the agriculturally rich landscapes of the far northern and southern areas of the region. In order to understand the geographical context in which complex societies arose, it is necessary to first review the environmental and ecological history of the circum-Titicaca region.

Many different methods have been used to track Holocene paleoclimatic trends in the Titicaca region. In the south central Andes, stable oxygen isotopes from the Quelccaya ice cap (Mélise and Roucou 1998; Thompson, et al. 1986), stable carbon isotopes of bulk organic matter from Lake Titicaca (Abbott, et al. 2003), diatom stratigraphy in lacustrine sediments (Tapia, et al. 2003), river sedimentation rates (Rigsby, et al. 2003), pollen studies (Grosjean, et al. 2003), and glacial histories (Seltzer 1993) have all been used as proxies to reconstruct past climatic conditions and track variation over time. As each of these responds to different kinds of variability, they each record different aspects of the climate. For example, lake sediments record decadal to centennial scale change, whereas terrestrial vegetation, responding to high frequency climate change occurring at a seasonal scale, will provide information of a much higher resolution (Grosjean, et al. 2003). Three of these proxies in particular—stable oxygen isotopes, diatom stratigraphy, and glacial history—have been critical to our understanding of *altiplano* climatic trends throughout the duration of its human occupation.

3.2.1 Stable oxygen isotopes from ice caps

Ice caps and ice sheets are important records of paleoclimate, documenting climatic features such as precipitation, air temperature, atmospheric composition, volcanic activity, and variations in

solar activity (Bradley 1985). Ice caps and ice sheets are composed of layers of snowfall; each snowfall event preserves information for the current climatic conditions. At certain high elevations, snow melt and sublimation are “essentially zero” (Bradley 1985:120), allowing for continuous accumulation of snow over very long periods of time. Analysis of stable isotopes is one of three approaches—along with dissolved and particulate matter, and the physical characteristics of firn and ice—to reconstruct paleoclimate with ice core data.

Studies of stable oxygen isotopes in ice caps and ice sheets track changes in temperature over time. Oxygen has three stable isotopes: ^{16}O , ^{17}O , and ^{18}O , that exist in relative concentrations of 99.76%, 0.04%, and 0.2%, respectively. ^{18}O is 12.5% heavier than ^{16}O , and the difference in these masses affects the strength of the covalent bonds these isotopes form with other elements (Faure and Mensing 2005:693). The parameter R represents isotopic composition, and is the ratio of the abundances of stable isotopes ($^{18}\text{O}/^{16}\text{O}$); R is defined by the number of atoms, rather than the masses of the different isotopes. The isotopic composition of any oxygen-containing molecule, expressed as R_{spl} , is measured against a seawater standard, expressed as R_{std} . The difference between the R values of the sample and the standard is represented by $\delta^{18}\text{O}$, where

$$\delta^{18}\text{O} = \left(\frac{R_{spl} - R_{std}}{R_{std}} \right) \times 10^3 \text{‰}$$

(Faure and Mensing 2005:Equation 26.7)

Values for $\delta^{18}\text{O}$ may be positive, negative, or zero, and express depletion or enrichment of ^{18}O in the sample. Positive values indicate that the sample has a higher concentration of ^{18}O than the seawater standard. Conversely, negative values indicate that the sample is depleted of ^{18}O relative to the seawater standard.

Water molecules may incorporate either ^{16}O or ^{18}O . Fractionation of ^{18}O is temperature dependent (Faure and Mensing 2005), and the vapor pressure of H_2^{16}O is higher than H_2^{18}O (Bradley 1985). Consequently, evaporation from a body of water results in a vapor that is relatively depleted in ^{18}O . The remaining water that does not evaporate becomes enriched with ^{18}O . However, because ^{18}O has a relatively lower vapor pressure, condensation favors water molecules containing the heavy isotope, such that, when compared to the vapor, the condensate is enriched in ^{18}O . Continued cooling will result in depletion of the condensate of ^{18}O ; large drops in temperature produce greater condensation with increasingly lower ^{18}O concentrations. $\delta^{18}\text{O}$ of condensate (precipitation) can be understood as a function of the temperature at which condensation occurs (Bradley 1985).

The $\delta^{18}\text{O}$ values of snow from ice caps and sheets therefore reflect a record of temperature changes that extend as far back in time as the Wisconsin glaciation, even at midlatitudes and at different locations across the Earth (Faure and Mensing 2005). The analysis of isotopic records can detect climatic variation at a decadal scale (Mélèze and Roucou 1998; Thompson, et al. 1986). Faure and Mensing note several constraints on using $\delta^{18}\text{O}$ as a proxy for temperature change, however. First, it is very difficult to determine the ages of annual snow layers that were deposited more than 1000 years ago, because ice cannot be easily dated using cosmogenic radionuclides. Continental ice sheets also flow outward, due to gravity; therefore, ice from or near the margins was originally formed upslope and then flowed to its current position. Ice sheet thickness tends to increase during glacial ages. This results in an increase in the elevation of the ice, and a consequent drop in annual temperature. Folding and faulting of the ice can cause disruptions in the isotopic record. Deep layers of ice are affected by their position in two ways. First, these ice layers become thin with age and are not resolvable.

Second, these layers are subject to melting due to pressure and geothermal heat flow.

Contamination by the fluid used to prevent the drill stem from becoming lodged in the ice also poses a problem (Faure and Mensing 2005:701-702). Notwithstanding these potential problems, Faure and Mensing argue that the benefits of this information for reconstructing paleoclimate, “justifies the effort that is required” (2005:702).

Thompson and colleagues analyzed two ice cores from the Quelccaya ice cap to reconstruct climatic conditions for the past 1000 years. The tropical Quelccaya ice cap is located at 13°56’S, 70°50’W, at an altitude of 5,470 m. The oxygen isotopic record exhibits an annual cycle in which the least negative $\delta^{18}\text{O}$ values occur in snow that accumulated during the dry winter months (May-October). Summer snow, in contrast, is more depleted of ^{18}O , making it “isotopically light” (Thompson et al. 1986:362). Unfortunately, occasional short-term variations in the concentrations of ^{18}O often preclude the identification of an annual cycle. Based on their analysis, Thompson et al. argue that “the Northern Hemisphere mean temperature departures and the Quelccaya summit core $\delta^{18}\text{O}$ are well linearly related” (1986:363). This finding is “remarkable” because the Quelccaya record represents only a single Southern Hemisphere site, while the Northern Hemisphere temperature record is drawn from a maximum of nine sites. A specific link between these two records is established by a very cold period between 1800-1820 AD; this period, first documented in the Northern Hemisphere record, corresponds with the most negative $\delta^{18}\text{O}$ values (indicating $\delta^{18}\text{O}$ depletion) found in the cores from the Quelccaya ice cap, suggesting that this cold period was a “global climate anomaly” (Thompson, et al. 1986:363). Similarly, a documented warm period between 1920-1940 AD is associated with the least negative $\delta^{18}\text{O}$ values. These types of findings highlight the global nature of the information that can be obtained from ice cap data.

Mélice and Roucou analyzed stable oxygen isotopes from the Quelccaya ice cap summit to demonstrate decadal time scale variability in climate for the Andean region over the last 500 years. While this period is much later in time than the present study, their results shed important light on short-term climatic fluctuations that can be extrapolated farther back in time. Their study evaluates the stability of the Quelccaya summit in time, specifying its spatial signature relative to sea surface temperature. Their analysis of ice core data revealed strong seasonality in $\delta^{18}\text{O}$, as well as significantly depleted values of ^{18}O overall. They also found that the greatest negative $\delta^{18}\text{O}$ values occur during the Austral summer, which is the rainy season in this region:

During this rainy season (November-April) rainfall is linked to the atmospheric water vapor transport from Amazonia to the Quelccaya ice cap. Abundant rainfall in Amazonia is accompanied by a strong ^{18}O depletion corresponding to the low values of the $\delta^{18}\text{O}$ analyzed in the ice core. (2005:118)

Conversely, the winter months correspond with relatively higher concentrations of ^{18}O , which corresponds with the dry season in the Amazon basin. Their results indicate that Quelccaya $\delta^{18}\text{O}$ record reflects tropical North Atlantic sea surface temperature; this relationship may be explained by the advection of water vapor from the tropical Atlantic Ocean. They also suggest that the Lake Titicaca Basin, only 1°S of the Quelccaya ice cap, is likely subject to the same origins of water vapor and precipitation mechanisms (Mélice and Roucou 1998:128).

3.2.2 Diatom stratigraphy

The analysis of diatoms found in stratified lacustrine sediments to track paleoclimatic shifts is one example of a suite of biological proxies for paleoclimate. The biogenic component of marine and lacustrine sediments includes the remains of planktonic (surface dwelling) and benthic (bottom dwelling) organism; together, these provide a record of past climate in terms of

water temperature and salinity, dissolved oxygen in deep water, nutrient and trace element concentrations, as well as other conditions (Bradley 1985). Of the biogenic component, diatoms, along with radiolarians and silicoflagellates, are among the most important siliceous materials used for reconstructing paleoclimate. Individual organisms found in marine or lacustrine sediments can be identified, often to the species level. Because each species is sensitive to specific environmental conditions, the distribution of diatoms can be used to track changes in the lake environment over time. Although it is theoretically possible to conduct isotopic analysis on diatoms, paleoclimate studies that utilize this proxy tend to focus on the changes in relative abundances of species and morphological variation (Bradley 1985:175-177).

In the *altiplano*, diatoms from Lake Titicaca are used as a proxy for changes in lake level, which, in turn, serves as a proxy for regional precipitation. The diatom record of Lake Titicaca is highly sensitive to climate change and registers millennial scale climatic variability (Tapia, et al. 2003). Changes in lake level, as well as related geochemical evolution in the basin, have a profound impact on sedimentary carbon, carbonates, and diatoms (D'Agostino, et al. 2002). Today, Lake Titicaca is oligosaline (0.1 gL^{-1} salinity; Baker, et al. 2005), and any changes in water level will have an inverse effect on the salinity of the lake (Tapia, et al. 2003); i.e., an increase in lake level results in decreased overall salinity. Because different species of diatoms live in different salinities, variation in the abundance of species, or the presence/absence of certain species, reflects specific lacustrine conditions. As variation in lake level depends primarily on the amount of precipitation that reaches the lake (Baker, et al. 2001), any changes in water level implies changes in the effective moisture of the region, which most likely result from large changes in regional precipitation (Tapia, et al. 2003).

Tapia and colleagues (2003) employ composite high-resolution diatom stratigraphy from Lake Titicaca to indicate long-term climate changes in the *altiplano* region. Operating on the assumptions outlined above, Tapia et al. analyzed the biogenic component of sediments from the deeper part of the lake, which contains a continuous record of late-Quaternary sedimentation. Their paleoclimatic interpretations were based on the changes in relative abundance of planktonic freshwater, planktonic salinity-indifferent, planktonic saline, and benthic assemblages in four cores taken from these deep areas. These cores have average sample resolutions ranging from ca. 200-500 cal yr, and the dates of one core extend to the Last Glacial Maximum (LGM; 21000 cal yr BP). The diatom records from these cores were compared with modern samples of surface sediments to determine variability in the salinity of lake water relative to the present level. The modern diatom record shows “(1) abundant planktonic freshwater taxa in deep water, dominated by *Cyclotella andina* with lower percentages of *Cyclotella meneghiniana*, *Cyclotella stelligera*-complex, and *Fragilaria crotonensis*; (2) high abundances of shallow-water benthic taxa confined to depths of less than 30 m; and (3) background levels of benthic flora, equal to or less than 20% of the total diatom count, in depths greater than 30 m” (Tapia, et al. 2003:157). *C. meneghiniana* occurs in saline and freshwater lakes and spans a wide range of depths. A dominance of *C. stelligera* and *C. andina*, which prefer freshwater environments, suggests decreased salinity, and, by inference, higher lake levels. *F. crotonensis* was not well represented in the core data (Tapia et al. 2003).

In sum, the comparison of the core record with the modern record revealed that,

two broad contrasting climatic patterns governed the Altiplano over the past 30,000 years: (1) a wet phase during the LGM until late-glacial times, which implies wet conditions in Amazonia, and (2), an extensive dry phase in the mid-Holocene. (Tapia et al. 2003:161)

These large-scale patterns are characterized by various smaller-scale climatic shifts. A steady high abundance of freshwater pelagic diatoms suggests wet conditions in the region from the LGM until about 11500 cal yr BP. During this time, the lake was above its present level. This period is followed by brief intervals of significant lake level decline from 11000-10000 cal yr BP, as indicated by “large pulses” of benthic diatom species (Tapia et al. 2005:139). This drop in lake level corresponds with a millennial-scale drought (Tapia et al. 2003:160). Freshwater conditions indicative of high lakestands prevailed from 10000 cal yr BP until 8000 cal yr BP, at which point freshwater planktonic diatoms disappeared and were replaced by benthic taxa and *C. meneghiniana*, indicating lake regression. The mid-Holocene (8000-4000 cal yr BP) is characterized by extremely arid conditions with low precipitation, as indicated by the presence of saline species *Chaetoceros muelleri*. The highest abundances of this species occurred circa 4500 BP. This long period of low lake levels ended ca. 4000 cal yr BP, and conditions similar to the modern lake were achieved ca. 1500 cal yr BP (approximately AD 500). At this time *C. andina* became dominant, *C. muelleri* disappeared, and benthic taxa remained at background levels (Tapia et al. 2003:160). These findings correspond with the analyses other paleoclimatic proxies, including stable oxygen and carbon isotopes, CaCO₃, and C/N ratios, all of which also indicate extreme arid conditions during the Holocene.

3.2.3 Glacial history

Late Quaternary glaciation has also served as a proxy for climate change in the central Andes. The timing and magnitude of glaciation is determined using radiocarbon dates of organic material associated with moraines produced during glacial advances. Unfortunately, these moraines can only provide a minimum age for glacial advance. The magnitude of past glaciation

can be estimated from the depression of glacier equilibrium-line altitudes (ELA), the elevation at which annual accumulation of snow is balanced by an equal amount of ablation (Bradley 1985). Comparison of past ELAs with the present ELA provides a measure of climate change relative to the present. ELA patterns can also reflect current climate dynamics. In the central Andes, for example, increasing aridity of the western cordillera in southern Peru and northern Bolivia—related to the “prevailing circulation around subtropical high-pressure cells centered at $\sim 30^{\circ}\text{S}$ ” (Bradley 1985:233)—is reflected by an increase in the east-west ELA gradient (Seltzer 1993).

Seltzer employed this proxy to establish an independent line of evidence for paleoclimatic shifts that could be compared with inferred archaeological evidence for past variations in climate. His analysis of past ELAs provides millennial scale climatic information for the central Andean region. Although the early Holocene may have been warm and moist, by 6000 cal yr BP the environment was warm and dry. Importantly, this finding corresponds with a 50 m drop in the lake level of Lake Titicaca ca. 7700 cal yr BP, which is indicative of arid conditions. Moreover, there is evidence for increased sand dune activity in the Bolivian lowlands between 7000—5000 cal yr BP. Seltzer found no evidence suggesting neoglaciation prior to 4000 cal yr BP. After 4000 BP, however, the climate became cooler and moister, as indicated by neoglaciation in the Cordillera Blanca. Pollen spectra from central Peru, which also suggest a cold interval from 2000-1000 cal yr BP, support this finding (Seltzer 1993).

Seltzer applies this late Holocene glacial history—an independent proxy for climate change—to an archaeological case study in the Mantaro River Valley, Peru. In this archaeological case, ethnobotanical remains were used to analyze changes in agriculture during the Wanka Period (Late Intermediate Period, ca. 1000-1460 AD; Seltzer and Hastorf 1990), but it is unclear if these observable changes were related to climatic shifts. Studies of glaciation

from the Nevado Huaytapallana, which borders the Mantaro River Valley, indicate that late Holocene glaciation occurred before 1300 cal yr BP, and after 650 cal yr BP. During this period, ELAs were depressed 50-150 m, and, by extension, the climate zones were depressed by the same amount (Seltzer 1993:135). If the upper limits of cultivation were depressed by 150 m, the maximum late-Holocene ELA depression in the area, there would be substantial reduction in the amount of land suitable for maize cultivation, but potatoes would be relatively unaffected. Maize is climatically sensitive, and cannot grow above 3,600 m (Seltzer and Hastorf 1990); potatoes, however, are more robust and can withstand higher elevations and colder conditions. An ELA depression of 150 m would result in a loss of only 5-7% of the potato fields, but up to 50% of maize fields. It would be expected, then, that archaeological remains would show a decrease in maize production during periods of extreme Holocene glaciation (Seltzer 1993).

Interestingly, the ethnobotanical remains recovered from archeological excavations in the valley do indicate a drop in maize ubiquity for Wanka II (1300-1460 AD) from earlier Wanka I times. Although this shift corresponds with the late Holocene glacial advance, it also corresponds with a change in the settlement pattern, which suggests movement towards defensible knolls. In these new locations, it would have been impossible to maintain the same level of maize production as in earlier periods (Seltzer 1993; Seltzer and Hastorf 1990). This important correlation precludes the acceptance of a climate change hypothesis, leading Seltzer to conclude, “climate change may have limited the production of at least maize, but probably did not directly affect cultural change at the time” (Seltzer 1993:136).

3.3.4 Summary of circum-Titicaca Holocene climate trends

During the early and Middle Holocene, the south central Andean region was far more arid than it is today. This general trend was marked by multicentennial periods during which precipitation was higher or lower than average (Craig, Aldenderfer, et al. 2010), long term trends that can be attributed to the influence of the South American summer monsoon (Baker, et al. 2001). The mid Holocene (8000-4000 cal BP; 6050-2050 BC) was characterized by extreme aridity. During this time, lake levels were 50-100 m lower than the present day, and precipitation was between 18 and 40 percent lower than modern levels (Craig, Aldenderfer, et al. 2010). This long time period was interrupted by millennium-long rise in lake levels ca. 7500-6500 BP (Tapia, et al. 2003), which was followed by some of the driest conditions of the Holocene, ca. 5300 BP (Grove, et al. 2003). The climate was generally wetter after 5000 BP, and modern climatic conditions were generally established by approximately after 4000 BP (Grosjean, et al. 2003). This date roughly corresponds with some of the early archaeological indications of reduced residential mobility in the Basin.

The existence of these long-term trends does not imply climatic stability, however. On short-term time scales, the climate of the Titicaca area is highly variable. Periods with stable long-term climatic averages are “tempered with the understanding that interannual variability is expressed by standard deviations ranging from 20 to 70 percent of the average means” (Binford and Kolata 1996:30). The Basin’s tropical latitude produces extreme wet-dry seasonality, and the high altitude causes pronounced diurnal fluctuations in temperature. Most precipitation is concentrated in the wet season months between December and March. The wet season (the Austral summer) is only marginally warmer than the dry season, with average temperatures ranging from -5°C to 23°C (Albarracin-Jordan 1996b:9). This means that frost can occur at any

time of the year, though it is most frequent during the dry season months, when minimum temperatures typically dip below 0°C. This is especially a problem at the bottom of *quebradas*, and on the *pampas* by the lake (Bandy 2001).

In addition, because the Titicaca basin is so large, even small changes in precipitation or other hydrological processes can have significant effects on lake levels (Janusek 2008). Due to the topography of the region, in which the *pampas* rise only gradually from the edge of the lake, what may seem like minute shifts in lake levels can actually translate to substantial changes in the shoreline. In fact, a mere shift of one meter in lake level can move the shoreline inland five kilometers, while a more significant five meter shift can move the shoreline more than 15 kilometers in some areas (Binford and Kolata 1996). Importantly, these types of small shifts are certainly typical of the region. Janusek (2008), for example, describes a minor rise in lake level that resulted in the flooding of the plains surrounding the site of Lukurmata; only eight years later, a corresponding drop in lake levels pushed the shoreline so far inland that resident fishers had to carve long canals just to place their boats in the lake. Based on these observations, he suggests that changes in lake level were likely an ongoing concern throughout history, and that “populations in the basin have adapted to such normal variation by diversifying production strategies and cultivating alliance and trade with groups in nearby and distant regions” (Janusek 2008:48).

3.3 History of human occupation in the Titicaca Basin

While the earliest date of human occupation in the Titicaca Basin is nebulous at best, there is unequivocal evidence of human presence by 7000 BC. Recent research has shown that human populations continuously occupied the northern and western Titicaca areas since the early

Holocene, and that population growth was steady over time (Craig, Aldenderfer, et al. 2010).

The following sections address the nature of this occupation and the chronology of major social, political, and economic transitions.

3.3.1 The northern and southern Titicaca areas

Over the last generation or so, archaeologists have come to recognize that the far northern and far southern areas of the Lake Titicaca Basin were the two areas of the most intense and earliest cultural development. Early archaeological studies of the Titicaca Basin chronology assumed a homogenous culture history for the entire region (Bennett 1934, 1936, 1948). As research progressed, however, scholars noted that the chronologies for the northern and southern sides of the lake followed divergent trajectories, despite some overlap in documented styles (Bennett 1950; Kidder 1948; Rowe 1956). Recent research has confirmed that the Titicaca region was home to similar, yet relatively independent, geopolitical spheres. This dissertation focuses on the cultural developments in the northern Titicaca area, drawing on examples from the south for comparative purposes.

Archaeologically, there are observable differences in the culture histories and settlement patterns of the northern and southern Basins, conventionally divided by the Ilave River, in the west, and the Escoma River, in the east (Plourde and Stanish 2006:244). Lisa Cipolla (2005) argues that the distinction between the northern and southern Titicaca areas is evident even in the lithic assemblages of the Archaic Period (pre-2000 BC). Subsequently, the earliest ceramic traditions in the north, which appear ca. 1400 BC, are characterized by mineral tempers, which aids in distinguishing them from the fiber-tempered wares produced in the south at this time

(Steadman 1994, 1995). While this difference has no functional explanation, it is nevertheless an important reflection of the divergent preferences of autonomous cultural areas.

The differences between the northern and southern Titicaca areas are especially pronounced in their culture histories, and in the radiocarbon record for the polities that come to define each region. Tiwanaku, with its core territory in the Tiwanaku, Katari, and Desaguadero Valley regions of the south Basin (Janusek 2008), represents the most complex political entity to develop in the Titicaca region. However, by the time Tiwanaku expanded beyond its heartland ca. AD 600, Pukara, the major polity of the north, had long since reached its peak (ca. AD 100-200), and collapsed. Archaeological survey has demonstrated no evidence of overlap in the site distributions of Pukara and Tiwanaku III (also known as Qeya or pre-expansive Tiwanaku; Janusek 2008; Stanish 2003). The only documented exception to this pattern is the archaeological site of Tumatamani, a ceremonial center situated near the modern town of Juli, in the southwestern Basin (Stanish and Steadman 1994). Moreover, not a single Tiwanaku sherd has been found at the site of Pukara (Klarich 2005).

Based on the lack of Tiwanaku III materials in the north Basin, for many years some scholars assumed that the years between the collapse of Pukara and the first appearance of Tiwanaku IV materials was marked by a cultural hiatus, ca. AD 400-600 (Lumbreras and Amat 1968). The extent of this hiatus was somewhat ambiguous, and it was unclear if it referred specifically to the production of a distinctive pottery style, or more generally, to settlement in the region as a whole. Recently, Charles Stanish (2003) and Cecilia Chávez (2008a) have discovered evidence that refutes this hypothetical hiatus. Their work, discussed in further detail in Chapter 7, suggests that in the north Basin, the Tiwanaku period corresponds with “Huaña,” a loosely aggregated polity with no recognizable fine pottery style (Stanish 2003).

The first unequivocal evidence of Tiwanaku occupation in the north Basin does not occur until at least AD 600, if not later. Tiwanaku settlement in the north further underscores the discontinuity between the northern and southern Titicaca areas, deviating significantly from the settlement pattern of the heartland:

The Tiwanaku settlement system north of the Ilave and Escoma river valleys is sporadic and strategically targeted at roads and sustainable areas near river, bays, and/or potential raised field areas...the logic of Tiwanaku expansion outside of its core area is most certainly related to interregional economic exchange, and this is most emphatically demonstrated by the survey data from the north. (Plourde and Stanish 2006:244)

North of the Ilave River, the Tiwanaku settlement system was characterized by discontinuous settlements that targeted roads and areas that would have been seasonally inundated, a pattern that was well adapted for the extraction of natural resources and the movement of trade goods.

3.3.2 Issues with chronology

Before delving into the chronology of the northern Titicaca area, I will first review the traditional concepts of chronology in the Andean region and the challenges that these pose for establishing a sequence of cultural developments in the Titicaca area. Chronology in the Andes has been traditionally viewed within a “Horizon framework” (Moseley 2001; Rice 1993; Rowe 1967). The term “Horizon” refers to periods in which an artistic style or tradition, associated with a particular culture, is distributed widely, homogeneously, and virtually contemporaneously across a region (Stanish 2003). The chronology of Andean prehistory is conventionally divided into three Horizons—Early, Middle, and Late—each of which is associated with a particular artistic tradition. These Horizons are interspersed with “Intermediate Periods”—Early and Late—which

are not associated as strongly with any one particular style, but are instead characterized by the simultaneous use of two or more styles (Rowe 1967).

While conceptually useful, the Horizon framework has proven somewhat problematic for understanding the behavioral dynamics of the south central Andes, of which the Titicaca Basin is the cultural and demographic center throughout prehistory. The implicit assumption of stylistic homogeneity tends to obscure processes and patterns at the local scale that often differ from the broader trends of the region as a whole. Although the Middle Horizon can be mapped somewhat onto the Tiwanaku style—which, in reality, begins many years before the polity’s expansion (Janusek 2008)—the Horizon framework has been especially difficult to adapt to the occupational history of the Lake Titicaca region (Stanish 2003). This problem exists in part because the archaeological evidence suggests different occupational sequences for the northern and southern Titicaca areas, as discussed above, but even more so because a “Horizon” implies a consistency for the Andean region that does not hold.

For example, the Early Horizon, as defined by the presence of Chavín-style iconography, hardly seems present in the Basin, if at all. Stanish notes the problems with this traditional approach to chronology, observing that,

the first monumental architecture on the Peruvian coast dates to perhaps 3000 B.C., but the first corporate architecture in the basin was not built until at least 1500 B.C., or probably even later. The dates for the Early Horizon and Early Intermediate Period likewise do not correspond to cultural developments in the area. Tiwanaku expansion occurred around A.D. 640 and ended around A.D. 1100, a century or two different from the Middle Horizon and Late Intermediate Periods. (Stanish 2003:89)

Moreover, while there is evidence of the Late Horizon in the Basin, Spanish documents suggest that the region enjoyed a relative measure of independence during this period. Prior to Inka arrival, the Titicaca area was home to the Colla and the Luqapa, which were rival *señoríos* (a

kingdom under a paramount lord). After finally defeating the Colla, the Lupaqa entered into an alliance with the Inka at a relatively early point in their imperialist phase, and because of their cooperation, were largely left to self-govern under the supervision of the Inka administration centers Hatunqolla and Chucuito (Cieza de León 1959 [1553]). The homogeneity implied by the Horizon framework glosses over the flexibility of Inka hegemony and the variability in the cultural dynamics of the Andean region as a whole.

Stanish, envisioning the Titicaca Basin as a relatively separate culture area, has attempted to mitigate the issues presented by the Horizon framework by employing what he terms a “dual chronological system” (see Stanish 2003:Figure 5.2 for full description). This system incorporates the local cultural trajectories of the Titicaca region alongside the broader processes represented by an evolutionary chronology. The “Formative Period,” the focus of this dissertation, refers to the period in which the earliest complex societies developed in the Basin, and is principally associated with two cultural traditions: Qaluyu and Pukara. In the following section, I summarize the phases of the Formative Period.

3.3.4 The Formative Period in the Lake Titicaca Basin

In the Titicaca region, the beginning of the Formative Period is marked by the first appearance of pottery; however, the use of ceramics alone does not define this era. Throughout the region, the Formative is characterized by distinct social, political, and economic developments, which begin with the transition to sedentary villages and culminate with the rise of competitive peer polities. For the northern Titicaca area, Stanish divides the Formative into three parts: Early, Middle, and Upper. Each of these periods corresponds with a significant cultural development, and is associated with a calendar interval based on radiocarbon dates (Stanish 2003). However, as

discussed above, ongoing research suggests that cultural evolution in the Titicaca region was not a homogenous process, and the changes in social, economic, and political organization vary by locality. As much of chronology is based on ceramics, Roddick, advocating more attention to local sequences, suggests, “a regional approach to seriation is not only premature, but also inappropriate for particular historic narratives” (Roddick 2009:176). In these prestate contexts, variation among sites was likely the norm, rather than the exception. It is important to emphasize that the dates reported here for the Early, Middle, and Upper Formative are not absolute, and that the real significance of these temporal divisions lies in the region-wide cultural shifts that they represent.

3.3.4.1 Early Formative (beginning ca. 2000 BC)

The beginning of the Early Formative Period, ca. 2000 BC (Stanish 2003:Ch. 6), represents the transition to the first settled villages after several millennia of living as mobile hunter-fisher-gatherers. This shift is characterized by “the appearance of permanent human settlements in which agriculture or intensive horticulture, intensive fishing, and the keeping of domesticated animals (predominantly camelids and guinea pigs) constituted a significant portion of the economy” (Stanish 2003:101). Such changes in land use had significant impacts on the local environment, and were likely responsible for at least partial deforestation of the Titicaca area (Craig, Aldenderfer, et al. 2010). Early Formative hamlets and villages, largely concentrated along the lakeshore, were relatively undifferentiated from one another, and there is no evidence for any kind of social ranking during this period. These settlements likely consisted of no more than a few dozen aggregated households and were probably no larger than one hectare, though they were usually much smaller (Griffin and Stanish 2007).

Importantly, the transition from the Terminal Archaic Period to the Early Formative Period was by no means homogenous across the region. Rather, it was a long-term process during which the cultures of the Titicaca region developed successful agricultural strategies, domesticated animal herds, exploited both lacustrine and terrestrial resources, and established sedentary villages (Stanish 2003). Social change occurred at different times in different areas, and some groups around the Basin did not adopt these new, alternative strategies until relative late in the Early Formative sequence (Plourde 2006). In the Ilave River drainage, for example, reduced residential mobility began fairly early, during the Late Archaic Period, approximately 3000 BC. After 2000 BC, Terminal Archaic occupation intensified, continuing until ca. 1300 BC (Craig, Aldenderfer, et al. 2010). It is, however, safe to say that by the end of the Early Formative, ca. 1300 BC, sedentary villages were the dominant form of settlement in the Titicaca region.

3.3.4.2 Middle Formative (ca. 1300-500 BC)

In the northern Basin, the Middle Formative Period represents the emergence of social status, ranking, and political hierarchy (Plourde 2006). During this period the first politically and economically complex societies emerged in the region (Plourde and Stanish 2006), marking a significant organizational transformation from the undifferentiated settlements of the Early Formative. Evidence for this shift includes “the appearance of ranking in settlement systems, intensification of subsistence production, the appearance of specialized architecture and space for political and ritual activities, and a regionally spread art style, as well as an increase in quantity and quality of prestige goods” (Plourde 2006:259). During the Middle Formative, for the first time in the history of human occupation in the Titicaca area, some villages become significantly

larger than others. Some of these large villages also became enhanced with special, non-domestic structures. The earliest of these structures were quite modest, and were essentially elaborated versions the domestic structures that had already been typical in the region for centuries. These sites, which Stanish terms “primary regional centers” likely functioned as civic-ceremonial centers characterized by sunken courts, as well as the production of stelae, elaborate mounds, and ritual artifacts (Stanish 2003:110).

The new class of non-domestic architecture found at these primary centers is evidence for the earliest cooperative labor organization in the Titicaca region. This development is significant because the products of this cooperative, or “corporate,” labor are well beyond the capacity of individual households. Such corporate architecture suggests the presence of higher status individuals who possess the capacity to mobilize and organize labor and resources at the supra-household level (Stanish 2003). There is also some evidence that these regional centers had some sort of influence or control over their neighbors in its immediate vicinity (Griffin and Stanish 2007). During this time a two-tiered ranking of site types and a three-tiered ranking of site size characterized the settlement pattern of the region, with smaller villages and hamlets clustered around larger primary centers (Plourde 2006; Stanish 2003:125).

The location of sites during the Middle Formative likely served to optimize local resources while facilitating interaction among the various settlements. Analysis of the Middle Formative settlement data from the Huancané-Putina region revealed a preference for site location at the base or along the sides of hills, and on the *pampa* near the river. Both of these locations would have provided access to the rivers and wet areas, as well as access to the road that runs up and down the valley. Relatively few sites were located at the lakeshore, reinforcing the observation that location near roads was a significant settlement determinant (Plourde

2006:445-446). Settlement data from the Pukara valley (Cohen 2010), as well as the Arapa and Taraco regions (Stanish and Umire 2004) likewise suggest a correlation between the most productive land (as indicated by relict raised fields and the availability of fresh water) and site placement. In the Huancané-Putina region, located in the northeastern Basin, sites identifiable as Middle Formative were concentrated in the lower half of the valley, suggesting a preference for wetlands or wetland resources at this time, or perhaps an increased reliance on agriculture. The fact that the earliest evidence for terraced and raised field agriculture also date to this period substantiates this final idea (Plourde 2006; Stanish 1994).

The Middle Formative complex societies of the northern Titicaca area are collectively and stylistically known as Qaluyu, named after the type-site in the northwestern Basin discovered by Manuel Chávez Ballón and John Rowe (Rowe 1956). In archaeological contexts, Qaluyu-style decorated wares define this period. Diagnostic Qaluyu forms include flat-bottom bowls, known as *tazones*, plainware neckless cooking pots (*ollas*; Steadman 1994), and burners (*incensarios*), which were often decorated with heavy incision (Chávez 1985; Steadman 1994). Qaluyu-style bowls are often slipped with brown, cream, or red. Finewares also exhibit other surface decorations such as painted geometric motifs executed in red-brown on cream, as well as curvilinear designs formed with wide, shallow incisions. Ceramic trumpets also appear for the first time during the Middle Formative as part of the suite of Yaya-Mama ritual paraphernalia (Chávez 1988; Cohen 2008; Plourde 2006).

Across the basin, the Middle Formative is associated with a ceremonial system known as the Yaya-Mama religious tradition (Chávez 1988). Also known as Pa'Ajanu, this tradition is manifested archaeologically by a coherent assemblage ritual architecture and artifacts (Cohen 2008), and represents the first pan-Titicaca Basin elite ideology (Janusek 2004; Stanish 2003:4).

The *Quechua* term “Yaya-Mama” was first coined by Sergio Chávez and Karen Mohr Chávez (1975) in reference to a stone stela, exhibiting both male (“yaya,” or father), and female (“mama,” or mother) attributes, found at the archaeological site of Taraco, located in the far northern Basin (Chávez and Chávez 1970). Cohen (2004, 2008), summarizing work by Chávez and Mohr Chávez, lists four features that comprise the package of Yaya-Mama ceremonialism. These include 1) architectural complexes centered around semi-subterranean courts, which represent one of the forms of “corporate” architecture discussed above, 2) a stone sculptural style depicting supernatural beings (Figure 3.2), 3) a suite of ritual paraphernalia including trumpets and incense burners (Figure 3.2), and 4) an iconographic style featuring elements including heads with projecting appendages and vertically divided eyes, anthropomorphic figures, checkered crosses, serpents, frogs, and forked serpent tongues (Chávez 1988; Chávez and Chávez 1975).

Stanish argues that while we cannot “read” the Yaya-Mama style, the stone stelae carved in this style “likely served to publicly announce that a particular elite group was part of a wider political and ideological system and to link emergent elite with established elite groups elsewhere in the region” (2003:133). As such, the Yaya-Mama religious tradition would have represented a powerful ideology capable of drawing supporters from other communities. Bandy (2006) argues for the importance of the Yaya-Mama religious tradition for the formation of stable population centers in the south Basin, citing that public ritual activities had the ability to “reduce, resolve, or redirect conflict within a village” (2006:233). He suggests that as a “social technology,” the Yaya-Mama tradition may have been a powerful factor that allowed for the establishment of large stable settlements during the Middle Formative.



Figure 3.2. (Left) Yaya-Mama stela from Chiripa, Bolivia (Chávez 2004:88); (right) ceramic trumpet (Chávez 2004:82)

In light of recent research, it is unclear how much of an impact the Yaya-Mama religious tradition actually had on Middle Formative populations. Cohen (2008) presents a compelling argument suggesting that Yaya-Mama religious tradition did not emerge as a cohesive whole. Instead, she suggests an “eclectic origin” for the tradition, arguing that the four diagnostic components (sunken courts, stone sculpture, ritual paraphernalia, and iconographic style) developed independently of one another and were assembled piecemeal from various locales throughout the Titicaca Basin and even beyond. Summarizing new evidence, Cohen argues that the features cited as the defining characteristics of the Yaya-Mama religious tradition are not actually consolidated into a complete, coherent package until the early part of the Upper Formative (Cohen 2008, 2010). These observations do not preclude Middle Formative ritual activities; rather, they imply much greater variability in Middle Formative ritual practices than originally believed. Perhaps more importantly, they also speak to a high level of interaction

among numerous settlements, interactions that ultimately culminated in the formalization of ceremonial practices during the Upper Formative. There is also substantial evidence suggesting that ancestor worship and the specialized treatment of human remains—including dedicatory burials and the taking of trophy heads—first appear in the Middle Formative (Hastorf 2003) and should be given greater consideration in our discussion of the ceremonial practices of this period.

3.3.4.3 Upper Formative (ca. 500 BC-AD 400)

Middle Formative behavioral trends favoring supra-household, cooperative labor become elaborated during the Upper Formative with the formation of the first multi-community polities (Bandy 2001; Stanish 2001a). The Upper Formative is defined by the rise of competitive peer polities and the development of highly ranked societies in some areas of the Titicaca Basin (Stanish 2003:Ch. 7), and the emergence of large political centers. The most powerful of these centers include Pukara and Taraco in the north, and Kala Uyuni (Bandy and Hastorf 2007), Khonko Wankane (Janusek 2008; Janusek and Plaza Martinez 2007), and Tiwanaku (Janusek 1994, 2004) in the south. By the latter part of the Upper Formative, ca. AD 100-200, most northern populations fell under the influence of the monumental center of Pukara, located in the northwestern Basin.

The shift from the Middle to the Upper Formative is characterized by “the adoption of social and political hierarchies, paralleled almost certainly by an economic hierarchy” (Stanish 2003:137). Whereas the Middle Formative Qaluyu societies show evidence of only simple ranking (Plourde and Stanish 2006), the polities of the Upper Formative exhibit pronounced differentiation. This evidence includes the construction of monumental architecture—such as walled sunken court areas, enclosed plazas, and artificial mountains—on a scale much larger

than witnessed during the Middle Formative. During the Upper Formative there are also pronounced changes in the regional site size hierarchy. Among these shifts was the addition of a “primate regional center” to the settlement system. These centers were “an order of magnitude larger than any other center in the Titicaca region,” (Stanish 2003:140), and only two examples of this site type developed in the Titicaca region: Pukara and Tiwanaku. Both sites are defined by the presence of a Kalasasaya complex (discussed further in Chapter 4), which includes a stone-lined sunken court, a stone enclosure, and adjacent hill that was a pyramid. These sites also contain cut-stone stelae; notably, the production of these objects was rare in the Upper Formative and was likely restricted to only a few sites around the entire Basin.

Fancy polychrome pottery, likely intended for ritual feasts or exchange, was also characteristic of the Upper Formative Period (Janusek 2004; Klarich 2005). Pukara-style pottery is generally associated with the Upper Formative occupation in the northern Basin. This style is characterized by polychrome zone-incised wares on which geometric and representational designs are painted with red, black, cream, and/or yellow pigment and outlined by incision. This decorative technique can be found on a variety of ceramic forms, including annular base bowls, *incensarios*, and trumpets (Chávez 1992; Franquemont 1986; Kidder 1948; Klarich 2005). Polished redwares are also diagnostic of this tradition, as well as a number of plainware types (Steadman 1995).

3.4 Issues in defining and dating the Formative Period

Despite recent advances in refining the chronology of the Titicaca area, I believe that, given the variability of other “Formative” civilizations outside of the Andean region, a smooth, stepwise chronology is not appropriate for modeling the dynamics of the Formative occupation in the

Basin. The heart of this problem lies in the fact that the Middle and Upper Formative are often identified in archaeological context by the presence of either Qaluyu or Pukara pottery; this reliance on styles to identify cultural dynamics is problematic for two reasons. The first problem is not unique to the Titicaca area and pertains to the inherent cultural-historical tendencies of the model. Although differences or changes in material style have long been argued to correspond with occupational phases, activity patterns, or cultural groups (e.g. see Binford and Binford 1966; Hegmon 1992), realistically, people do not collectively adopt or discard a style with the speed that such a model implies. This issue, which can often be overcome by analyzing frequency distributions of archaeological materials, is compounded by the second problem, which relates to the ceramic typology of the northern Basin. Plourde (2006) notes that while the Qaluyu and Pukara fineware styles are distinctive in their own right, the ceramic typology of the northern Basin has significant limitations. Her primary concern is the lack of defined plainwares for the Middle and Upper Formative Periods. Although some diagnostic forms have been identified (data suggest that neckless *ollas* are overwhelmingly restricted to the Middle Formative, for example), overall, these utilitarian wares are not very useful chronological markers for assigning a site to either the Middle or Upper Formative. More often, these forms simply identify a site as belonging to the Formative in general, a period that, in some areas of the Basin, last upwards of 2,500 years (Plourde 2006:437).

3.4.1 A probabilistic perspective on Formative chronology

These issues beg the investigation of alternative methods for assessing chronology and chronological shifts. One particularly promising approach is a reevaluation of the existing radiocarbon record that does not assume the sequential development and replacement of styles,

but rather, considers each stylistic tradition as having its own trajectory. In the northern Basin, the two ceramic fineware styles, Qaluyu and Pukara, defined during limited excavations and through survey work, have long been assumed to correlate with discrete and sequential cultural groups during the Formative. While this may not be an issue when dealing with individual sites, complications arise when we begin to make comparisons among sites across the region. Many of the ambiguities in the interpretation of the archaeological record of the region stem from the fact that archaeologists have been unable to establish a sound chronology for the Middle to Upper Formative transition. Precisely dating these archaeological assemblages on a regional scale is a critical first step towards understanding the cultural processes that underlie stylistic transformations.

Fortunately, recent archaeological research in the northern Basin and the surrounding areas has provided a reasonably robust corpus of radiocarbon dates. This data set allows us, for the first time, to evaluate the temporal distribution of Qaluyu and Pukara pottery for the calendar interval 1500 BC-AD 500 and obtain a more realistic impression for the chronology of human occupation and behavioral shifts. It is possible to use the radiocarbon record associated with each stylistic tradition to examine the temporal dynamics of the Qaluyu and Pukara stylistic traditions. The underlying assumption of this approach is that the probability distributions of radiocarbon dates serve as a proxy for the relative intensity of human occupation during the associated calendar interval (Brantingham, et al. 2004). This approach has been applied by Brantingham and colleagues with great success for the East Asian Paleolithic (Brantingham et al. 2004), and by Whitehead (2007) for the south Basin site of Kala Uyuni.

In order to apply this approach to the north Basin Formative, I compiled a list of reported radiocarbon dates from four sites in the northern Titicaca Basin—Pukara, Qaluyu, Camata, and

Cachichupa—and one site in the Cuzco area—Chanapata (Rowe 1944)—along with information about their associated ceramic finds (Chávez 1977; Franquemont 1986; Klarich 2005; Mujica 1985; Plourde 2006; Ralph 1959; Steadman 1995). Radiocarbon samples were separated according to their stylistic associations, and only dates that were explicitly known to be associated with either Qaluyu or Pukara style ceramics were considered. Unfortunately, this meant excluding nine dates, found to be associated with both Qaluyu and Pukara ceramic materials, from Area A (Terrace K-2) at the site of Cachichupa, which will be discussed further in Chapter 4. Plourde, who conducted these excavations, identified this context as “fill layers, most likely collected from nearby” (2006:602). As such, it was impossible to determine if these radiocarbon dates were actually associated with the construction of Terrace K-2, or if they were actually from earlier activities and became included in the construction fill purely by chance. With these dates excluded, the sample, in total, consisted of 19 Qaluyu-associated dates and 33 Pukara-associated dates.

Comparison of the Qaluyu and Pukara trajectories was based on calibrated radiocarbon dates and their associated summed probability density distributions, which were created by combining the probability distributions of the individual dates. These curves show the relative probability of a radiocarbon sample dating to a given calendar age, and serve as a more precise proxy for the intensity of occupation than histograms of the uncalibrated dates (Brantingham, et al. 2004; Michczynski 2004).

3.4.1.1 Potential issues with this approach

Before discussing the results of the comparison, I will first highlight some of the potential problems associated with this methodology. Foremost are issues directly related to the

calibration of radiocarbon dates. Most of these stem from variation in the production of ^{14}C over the last 40,000 years, which results in an instability of atmospheric $^{14}\text{C}/^{12}\text{C}$ ratio over time (Whitehead 2007).² Calibration is designed to correct for these fluctuations by comparing ^{14}C measurements with calendar ages provided by other independent dating methods (Bard 1998), such as dendrochronology (Reimer, et al. 2004), or U-Th ages from corals (Bard, et al. 1990). It is important to emphasize here that individual radiocarbon dates do not represent points in time, but are instead probability distributions. Calibration of a radiocarbon date yields a calendar age range, and the features of the calibration curve at the point of interception will determine how robust (i.e., the size of the error) the date actually is. Although recent revisions to the curve have significantly improved chronological resolution, problems still exist for the calibration of samples that derive from periods of relatively constant ^{14}C fluctuation (Blackwell, et al. 2006). The resultant plateaus in the calibration curve pose problems for assigning calendar age ranges to samples dating to certain radiocarbon year intervals.

Brantingham et al. (2004) cite two other potential sources of error that may arise when using radiocarbon dates to estimate the intensity of human occupation. The first is related to incomplete sampling of certain time periods or certain geographical locations (Rick 1987). This problem is particularly relevant to the Titicaca area, which has suffered from an uneven distribution of archaeological attention. For example, early research tended to focus on the chronology of the southern Titicaca area (Bennett 1934, 1936, 1948) with the implicit assumption of a homogenous culture history for the entire circum-Titicaca region. As a result, the majority of the radiocarbon record from the Titicaca area pertains to Tiwanaku period

² Bard (1998) discusses three of the most significant geophysical, climatological, and astrophysical sources of variation in the $^{14}\text{C}/^{12}\text{C}$ ratio. Centennial scale variations can be “linked to cosmic-ray modulation by the magnetic properties of the solar wind” (1998:2036). A gradually increasing intensity of the Earth’s magnetic dipole has caused fluctuations over the last 30,000 years. Internal changes in the carbon cycle have affected atmospheric $\Delta^{14}\text{C}$.

contexts and sites. Moreover, the majority of archaeological research in the north has focused on Pukara, and it is likely that this epistemological preference has biased the radiocarbon record against the inclusion of Qaluyu-associated dates, and perhaps particular types of sites.

Errors in the reported archaeological associations of radiocarbon dates present a second major problem. When dealing with published data, we must sometimes assume that samples of radiocarbon were found in “primary association” with unmixed archaeological materials (Brantingham, et al. 2004). Unfortunately, it is practically impossible to correct for errors committed by the original excavators.

A final potential issue for this approach may arise from taphonomic biases. Over time, destructive processes can produce positive curvilinear frequency distributions for archaeological sites and materials (i.e., the number of sites/materials increase through time). Post-depositional processes can bias the archaeological record in favor of younger materials, making them appear artificially abundant relative to older deposits. As modeled by Surovell and Brantingham (2007), these destructive processes can undermine the assumption that a stronger archaeological signal is the result of more people and hinder the extraction of a true demographic signal from the frequencies of dates or sites alone. The rates of taphonomic processes vary by region, time periods, and material, and these factors further compound this issue (Surovell and Brantingham 2007).

By paying careful attention to these potential problems, and taking measures to correct them, it is possible to overcome these difficulties and produce robust results. Problems associated with plateaus in the calibration curve are resolved through the incorporation of stratigraphic information into the database, helping to arrange samples in their appropriate chronological position and resolve ambiguities that stem from calibration. Although sampling

biases are a real concern, I believe that the radiocarbon record, even if incompletely sampled, is sufficient to provide a general shape of the probability curve, and, by extension, the temporal distribution of occupation intensities (Brantingham et al. 2004). I have also attempted to control biases in the sample introduced during excavation by examining primary data and, when possible, communicating with the original excavators who were able to provide me with good stratigraphic associations. Finally, with regard to the limitations presented by taphonomic processes, given the relatively short time span considered here, it is unlikely that post-depositional processes constitute a major bias for this study.

3.4.1.2 Results

Radiocarbon ages for Qaluyu and Pukara-associated radiocarbon samples were calibrated using the program Cal Pal (Version March 2007; Weninger 1986), using the Holocene tree-ring calibration data IntCal04 (Reimer, et al. 2004). Following calibration, summed probability density distributions were calculated for the Qaluyu and Pukara-associated samples, with the probabilities scaled to 2000. I will first discuss the results of each individual data set, and then I will discuss the data sets relative to each other.

The summed probability density distribution of the Qaluyu-associated dates suggest a long calendar interval for this style of ca. 1420 BC-AD 50 (Figure 3.3). The midpoints of the individual calibrated dates, however, indicate a more restricted range of 1150-200 BC. The shape of the summed probability density distribution curve suggests a Qaluyu occupation in the northern Titicaca Basin that begins suddenly ca. 1400 BC and reaches its peak intensity ca. 1050 BC. A plateau in the curve between 1050-200 BC suggests sustained levels of activity,

punctuated by minor fluctuations, over the next 850 years. From 200 BC-AD 1, there is a sharp decline from this sustained level of activity until Qaluyu ceramics are no longer used ca. AD 50.

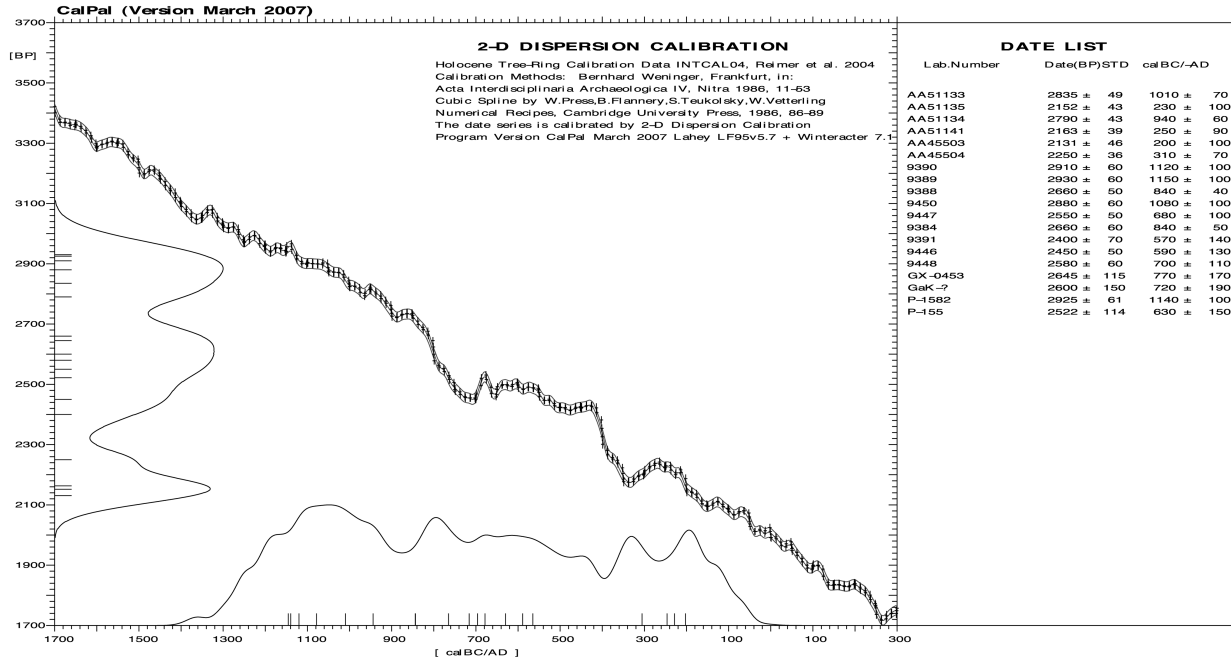


Figure 3.3. Summed probability distribution curve for calibrated ¹⁴C dates associated with Qaluyu pottery

The summed probability density distribution of the Pukara-associated dates is shown in Figure 3.4. The calendar interval for samples the associated with Pukara ceramics ranges from 420 BC-AD 650, an interval very close to that suggested by Stanish (2003). Again, the midpoints for the individual calibrated dates have a more truncated range of 270 BC-AD 460, although one outlier from the site of Camata (Steadman 1995) dates to 970 BC ± 80. From 420 BC-AD 1, the intensity of Pukara occupation increases rapidly; this incline is marked by a smaller peak at 350 BC. After AD 1 there is a sharp decline in the curve. The rate of this decline slows at AD 150, and some detectable levels of Pukara-related activity continue until AD 610.

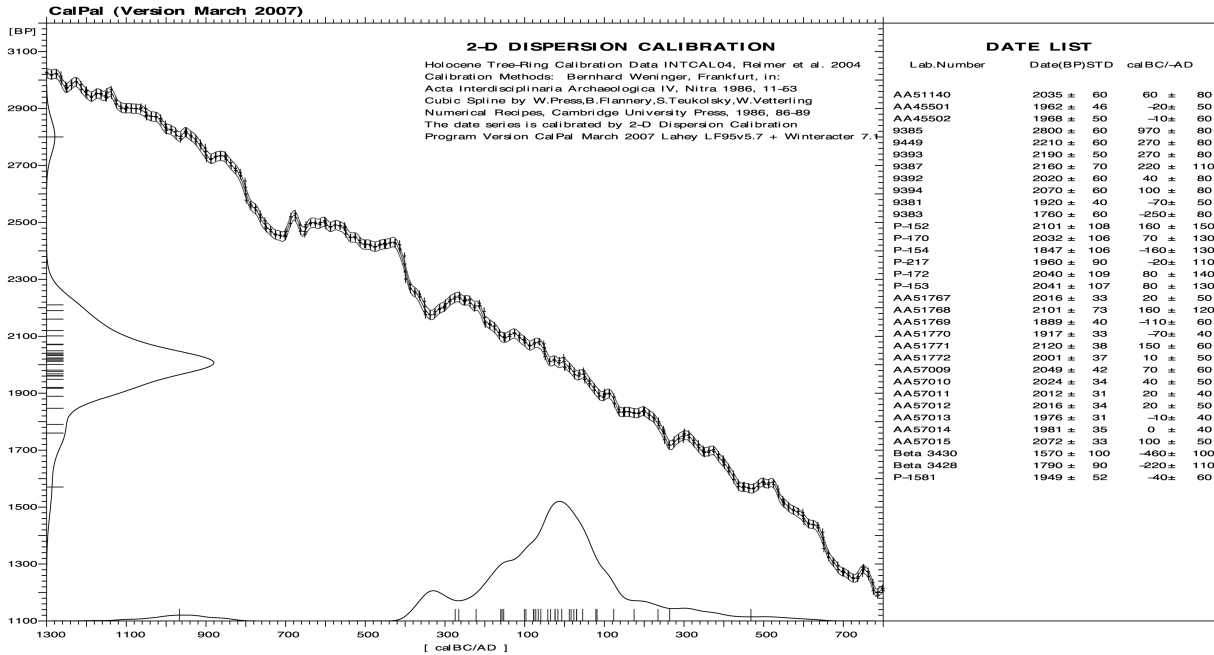


Figure 3.4. Summed probability distribution curve for calibrated ^{14}C dates associated with Pukara pottery

Superimposing the two probability distribution curves allows for the comparison of the Qaluyu and Pukara trajectories. The resultant plot shows that the use of Qaluyu and Pukara ceramics actually overlapped for a substantial period of time between 400 BC and AD 1 (Figure 3.5). This is not simply an overlap in their respective probability distributions; there is also an overlap of the uncalibrated and calibrated dates of each of the samples. Both curves increase until ca. 200 BC, at which point the Qaluyu curve reaches its final peak before beginning a sharp decline. Importantly, this final peak cannot be related to any ambiguities in the radiocarbon calibration curve. This trend continues until AD 1, at which point the Pukara curve reaches its peak and the Qaluyu curve suddenly falls to zero.

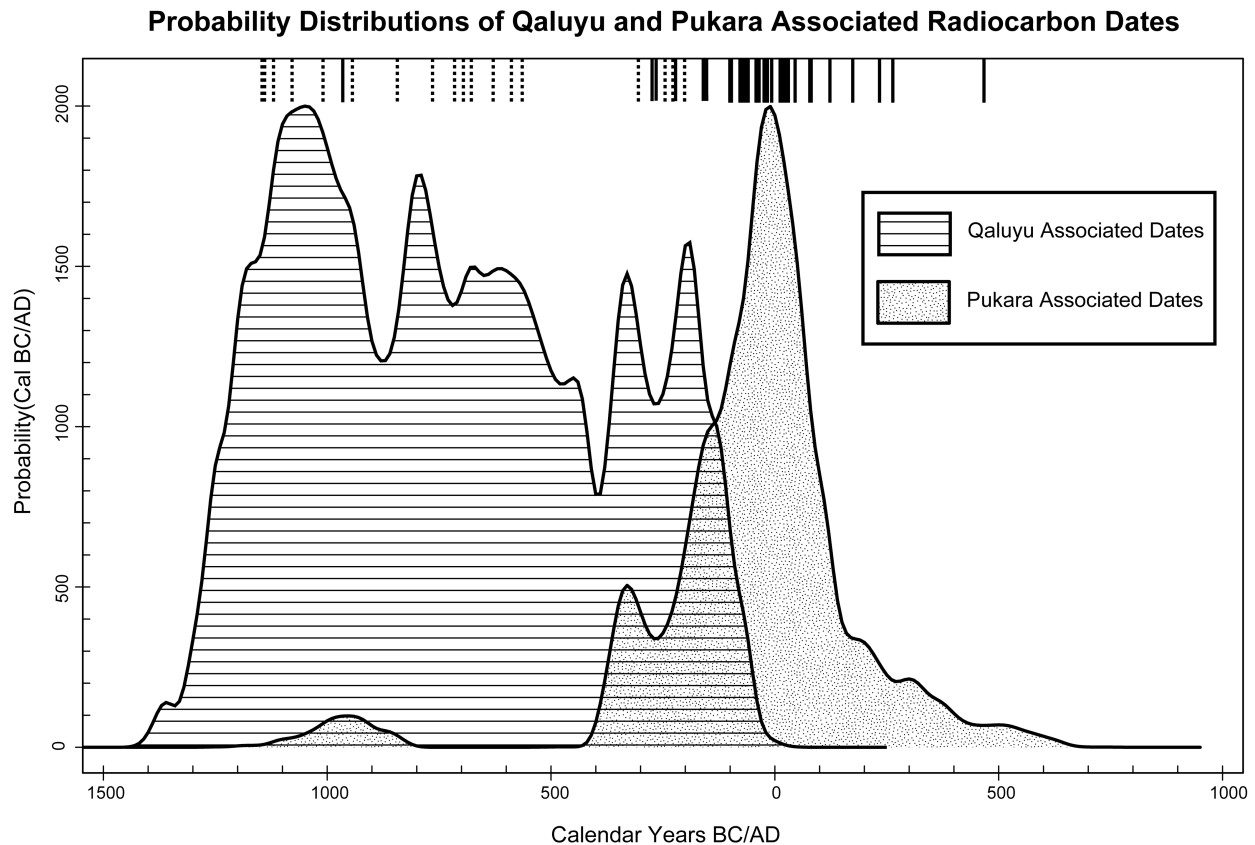


Figure 3.5. Superimposed summed probability distribution curves for Qaluyu and Pukara associated ^{14}C dates. Dashed lines represent the midpoints for dates associated with Qaluyu pottery; solid lines denote midpoints for dates associated with Pukara pottery.

Graphically, it appears that the increase in the Pukara curve may be correlated with the decline of the Qaluyu curve during the calendar interval 200 BC-AD 1. This hypothesis was tested using a linear regression model, which analyzed the covariance of the two probability curves. The probabilities for Qaluyu and Pukara-associated dates were plotted against each other for the calendar years 200 BC-AD 1 at decadal intervals (Figure 3.6). This analysis indicates that the rapid increase in the Pukara-associated activities is strongly correlated with the rapid decline in the Qaluyu-associated activities (adjusted R -squared = 0.9424, $p < 0.0001$). Despite this correlation, we must be careful not to assume that the decline in Qaluyu related activities was, by necessity, the cause of the success in Pukara-related activities, or vice versa. The exact nature of the relationship is determined, in part, by the nature of the calibration curve at this

point, as well as statistical error in the dates. With larger samples of dates, it is likely that the actual chronological relationship (i.e., the rates) between the decline of Qaluyu and the rise of Pukara will become clear.

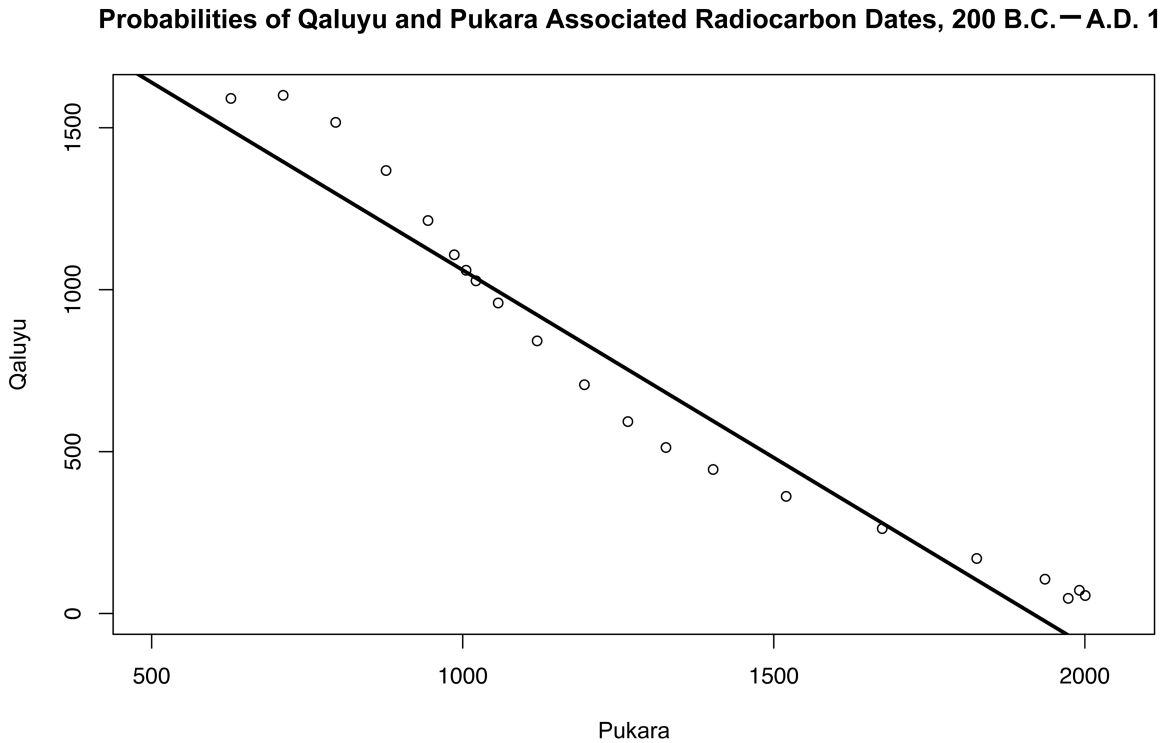


Figure 3.6. Linear regression of Qaluyu and Pukara associated probability densities, 200 B.C.-A.D. 1 at decadal intervals.

A second area of interest in the graph occurs at 350 BC. At this point, both curves exhibit a small peak of similar magnitude. I argue that these peaks do not result from significant increases in activity at this calendar date; rather, this similarity appears to be an artifact of the radiocarbon calibration curve. Along these same lines, it is likely that the small peak in the Qaluyu curve at 800 BC can also be attributed to calibration. The “noise” in the plateau between 900-200 BC is probably a third product of the calibration curve, which is relative flat between the calendar interval 700-430 BC (corresponding with 2400-2540 BP). This plateau results in

calibrated dates with wider—and therefore likely overlapping—probability distributions.

Interestingly, the Pukara-associated dates are less affected by the ambiguities in this area of the calibration curve because their radiocarbon ages fall in the interval 2210-1570 BP.

The results of these analyses provide a revised picture of Formative Period cultural dynamics in the northern Titicaca Basin. One of the more significant outcomes of the study is that the radiocarbon dates associated with Qaluyu-style materials may be as young as 200 BC, with the probability distribution of the dates extending into the 1st century AD. This result suggests use of the Qaluyu style three or more centuries longer than the conventionally accepted calendar interval for the Middle Formative, 1300-500 BC.

The data also indicate an important, and previously unrecognized, element of Formative Period cultural dynamics: a period in excess of 400 years during which the Qaluyu and Pukara styles overlap. This finding deviates from a key assumption of the “Horizon framework” discussed earlier. Although this framework includes “Intermediate Periods” characterized by centuries of considerable heterogeneity in ceramic styles, these periods refer to variability *across*, rather than *within*, the many culture areas of the Andes (see Donnan 1992). Such a concept suggests that Qaluyu and Pukara pottery styles would have been restricted to discrete time periods, and the transition from the Middle to Upper Formative would have been characterized by the relatively rapid replacement of one style by the other. Rather, I found that while Qaluyu is generally older than Pukara, and that Pukara is generally younger than Qaluyu, the overlap in their radiocarbon records indicates that these two styles were both in use *in the same region* for at least four centuries.

These results are significant because they force us to reevaluate and revise our accepted notions of chronology in the northern Titicaca region. I do not, however, believe that these

ceramic styles are not useful chronological markers. The overall trend indicates that the Qaluyu style is generally older than the Pukara style. The extent to which they overlapped in space, however, remains unclear, especially given that data from only four sites were considered in the analysis. It is possible that Qaluyu and Pukara style ceramics were not used simultaneously in any single occupation center, but that certain communities adopted the new style while others continued to use the older Qaluyu style ceramics. However, it is also possible that communities were, in fact, using both styles simultaneously. Regardless of either scenario, the radiocarbon record unequivocally indicates that Qaluyu and Pukara ceramics were both in use from ca. 400 BC up through AD 1, corresponding with the early part of the Upper Formative. By extension, these data also suggest that the transition from the Middle to Upper Formative was not homogenous in timing across the northern Titicaca Basin. These results beg the formulation of more subtle models for better understanding the complex cultural dynamics of the region during this time. Rather than a smooth evolutionary shift over time, we must propose a much more dynamic political landscape of chiefly cycling, conflict, cooperation, alliance building, and fissioning.

3.4.2 Other issues for dating the Formative

In addition to the temporal overlap of Formative ceramics styles, this analysis also highlights some of the challenges we face when simply attempting to date the Formative period using radiocarbon dates. As discussed earlier, the radiocarbon calibration curve presents some problems for inferring the tempo and sequence of cultural changes because the curve is not a uniform line. Again, it is not uncommon to encounter plateaus or steep drop-offs in portions of the curve. For samples whose radiocarbon ages fall in these areas, calibration can produce

calendar age ranges that may be misleading (see discussion in Whitehead 2007). As illustrated in Figure 3.7, the portion of the radiocarbon calibration curve corresponding with the Formative Period in the northern Basin contains three anomalous areas that present significant challenges for establishing a sound chronology based on radiocarbon dates.

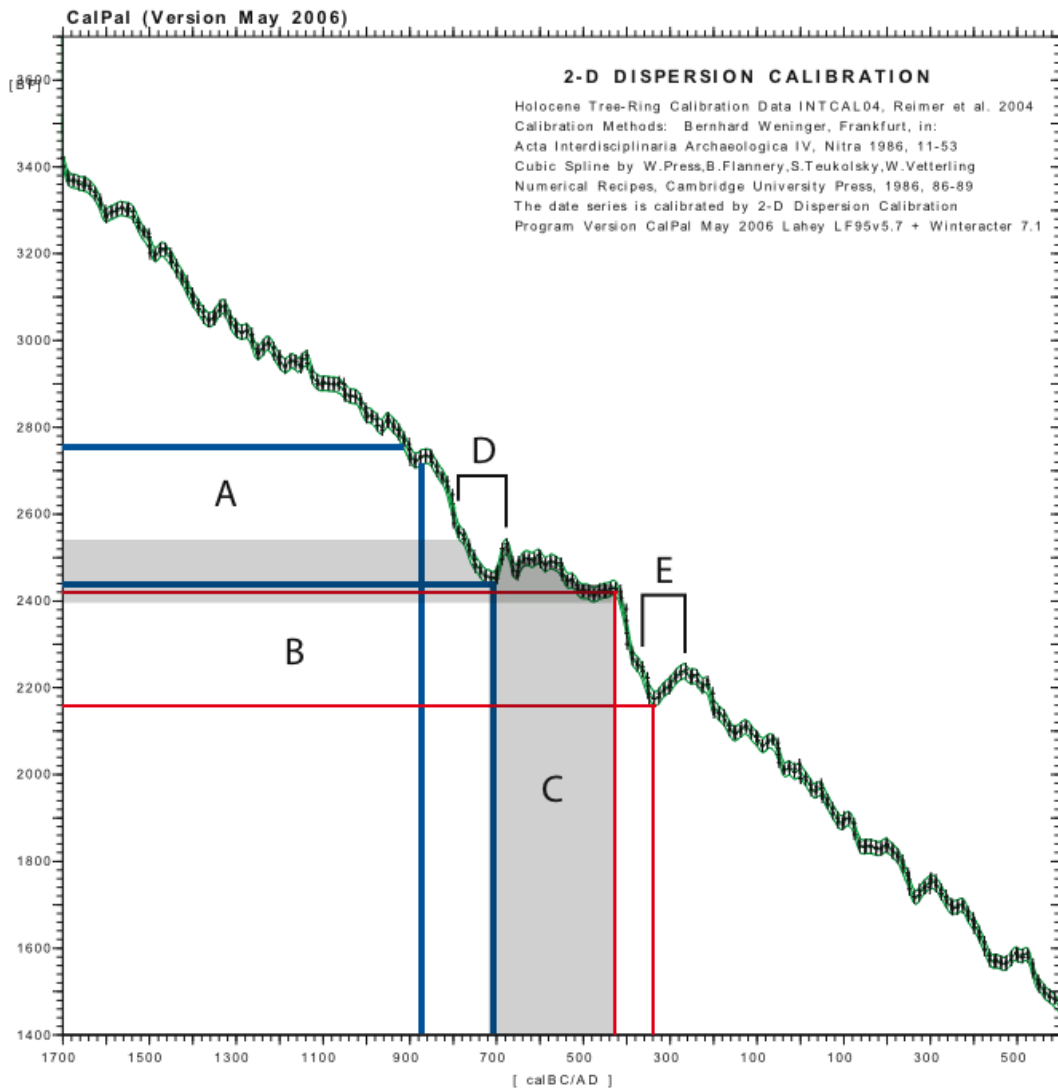


Figure 3.7. Radiocarbon calibration curve for the north Basin Formative Period

The first anomaly, “A,” occurs at the interval 2750-2430 BP. In this area of the curve, the slope of the line is relatively steep. Steepness in the slope of the calibration curve is often related to inaccurate calibrated dates. The calibration of any samples with a radiocarbon age

falling in this interval will produce ages that tightly cluster in the calendar year range 860-700 BC. In other words, the steep slope of the curve compresses all of the samples with radiocarbon ages in this 320-year interval into only 160 calendar years. Dates that may have different radiocarbon ages, once calibrated, could potentially have the same calendar age. This fact poses a problem for study of the Middle Formative Period because it limits chronological resolution, a serious issue when examining cultural changes that occur on sub-centennial time scales. Any steep area of the radiocarbon calibration curve, such as that which occurs at “A,” makes it difficult to establish a sequence of cultural developments based on associated radiocarbon alone. For this reason, problems may arise when comparing across archaeological sites whose dates fall in this time period, because radiocarbon dates are the principal means of establishing chronological sequences in the absence of clear stratigraphic associations.

A second steep area, “B,” occurs between the radiocarbon years 2420-2160 BP. Calibrated dates with radiocarbon ages falling in this interval will tightly cluster in the calendar year range 430-340 BC. As with “A,” samples in this 270-year radiocarbon interval will produce calibrated ages in a relatively more truncated range of 90 calendar years. Again, steepness in this area of the calibration curve results in the lumping of dates with different radiocarbon ages, which translates to lowered chronological resolution and calibrated dates of limited accuracy. This anomaly may explain some, but certainly not all, of the overlap between the Qaluyu and Pukara-associated dates.

The problems stemming from these steep areas of the calibration curve are compounded by the presence of an ambiguous, flat portion that lies between them, from 700-430 BC. A relatively flat curve presents a different kind of problem than a steep curve—it is not an issue of accuracy, but rather one of precision. In the “C” interval, there is not very much change in the

slope of the calibration curve, and this observable flatness results in calibrated dates with probability distributions that are relatively wide. It therefore becomes impossible to assign a calendar age to a radiocarbon sample with any degree of precision. These abnormally wide distributions limit the utility of the date for two reasons. First, calendar age ranges of different samples—even those recovered from different stratigraphic contexts—overlap to the point where they cannot be differentiated. Second, it is impossible to know where in the probability distribution the “actual” date lies. The problems presented by overly flat curves can be expressed in another way: when looking at the calibration curve, it is clear that any event that transpired, real time, between the calendar years 700-430 BC cannot be dated effectively using radiocarbon because all of the sample would be compressed into the interval 2400-2540 BP. Even if the samples derive from the poles of this calendar interval, analysis would indicate similar radiocarbon ages, which would translate to overlapping calendar age ranges.

The two points at which “C” joins with “A” and “B” also pose problems for dating the Formative period. These are areas of abrupt changes in the slope of the line; at these points the normally decreasing curve suddenly veers upward before steeply dropping off again. These features of the calibration curve are a result of fluctuations in the production of atmospheric ^{14}C over time (Bradley 1985). Due to these fluctuations, samples with radiocarbon ages that fall within the intervals 2540-2440 BP (“D”) and 2230-2150 BP (“E”) intercept the calibration curve at multiple points, and therefore cannot be assigned to a single calendar age range (cf. Bradley 1985: Fig 3.12). A sample with a radiocarbon age of 2500 ± 50 years, for example, would yield a calibrated age in the one sigma range of 770-726 BC (22%) or 694-541 BC (78%). A sample with a radiocarbon age of 2200 ± 50 produces an even more ambiguous result; in the one-sigma range, calibration produces a calendar age in the range 359-256 BC (59%) or 259-202 BC (41%).

From these examples, it is clear how situations of multiple intercepts present complications for obtaining a calendar age for a sample of radiocarbon.

Despite these issues, using radiocarbon dates to establish a sound chronology for the Formative Period is not a futile endeavor. The areas of the curve that are especially problematic are only for the calendar interval 860-340 BC (corresponding with the radiocarbon year interval 2750-2160 BP). Any samples from outside of this range can be dated with greater accuracy and precision. The fluctuations in the radiocarbon calibration curve do not affect the early part of the Middle Formative, or the majority of the Upper Formative. These two phases, which are well out of the range of the problematic areas, are important for our understanding of the development of regional centers and the evolution of multi-community polities in the Titicaca region. Furthermore, even for dating events that occurred, real time, within the problematic calendar interval it is important to continue collecting dates so as to understand approximately when events occurred—low-resolution dates are better than no dates at all. Also, because calibration is based on probability distributions, the inclusion of more dates will result in greater accuracy and precision than can be achieved in the calibration of a single date. Finally, the issues related to the calibration of radiocarbon dates underscore the importance of careful excavations and recording of stratigraphic relationships in archaeological contexts. When considering data from a single site, stratigraphic patterns, confirmed through multiple excavations at a site, can help to resolve the issues that arise from ambiguous or low-resolution dates. Comparing data across sites, however, presents additional challenges because we cannot expect identical stratigraphic relationships for different communities with unique occupational histories. I do not believe that these challenges are insurmountable, and that with careful attention to detail and the addition of

more radiocarbon dates, we will be able to reconstruct the cultural sequence for the Formative Period with even greater precision.

CHAPTER 4: EARLY CENTERS IN THE LAKE TITICACA BASIN

4.1 Introduction

This chapter presents a review of early regional centers in the Lake Titicaca Basin.

Archaeologically, these centers are defined by the presence of certain forms of non-domestic, corporate architecture, which scholars have termed a “Kalassasaya” or “Qalasaya” complex in reference to the massive stone blocks that were used for construction. In this review, I operationalize the concepts introduced in Chapter 2, and specifically discuss how certain factors—including labor, trade, and conflict—contributed to the rapidly evolving social and political landscape of the Titicaca Basin during the Formative Period. I argue that such forms of non-domestic architecture both symbolize and reinforce intra-group cooperation, the key to increasingly complex forms of political and economic organizations. This information presented in this chapter will provide a necessary background and baseline for tracing the economic and political development of Taraco, one of only two major centers that remained in the northern Basin by the first century AD.

4.2 Identifying early centers: corporate architecture

As discussed in Chapter 3, the emergence of aggregated political centers in the northern Lake Titicaca Basin took place during the Middle Formative period. Evidence of this phenomenon can be seen as early as the middle of the second millennium BC. Empirically, this transition is quite remarkable; after several millennia of living as relatively mobile hunters, gatherers, and fishers, a few groups of people in a few places around the Titicaca area began enhancing their villages, building special purpose structures in places that had previously been domestic areas. The earliest of these constructions were fairly modest and can be easily understood as elaborations of the domestic structures that had been typical of the region for centuries. Stanish (2003:114) refers to this new suite of non-domestic architectural features, which included courts, pyramids, and walled enclosures, as the “Kalasasaya complex.” The earliest appearance of this complex, which involved the transformation of domestic space into loci of communal civic-ceremonial events, represents an important transition in the human history of the region.

Over the next two millennia, these new architectural features grew in size and complexity. The earliest period of sunken court architecture was characterized by numerous—even perhaps hundreds—of such settlements, which were scattered throughout the Basin. Initially, these constructions were essentially small courts and/or semi-subterranean pit-houses. As time passed, the size and complexity of the architecture increased, with the addition of walled areas and low elevated mounds. At the same time, however, there was a reduction in the total number of settlements containing this architectural complex. It may be argued that this trend—the simultaneous elaboration of non-domestic architecture and an increasingly pronounced settlement hierarchy—culminated with the construction of the great architectural center of Tiwanaku in the southern Basin.

The development of this new form of architecture parallels the evolution of social complexity in the region. As the product of collective labor efforts and the venues for communal ritual and political events, it is further likely that this new form of corporate architecture played a significant role in the development of new and more complex forms of social organization. In general evolutionary terms, many aspects of corporate architecture, from the process of its construction to the events that it housed, served to promote new ideologies that countered ego-directed (or, more likely in this case, household-directed) behavior and shifted it towards more cooperative strategies. Cooperation or altruistic behaviors, which involve relinquishing some measure of autonomy for the good of the group, are critical to the development of increasingly complex and highly interdependent forms of social organization. Specifically, the “Kalassasaya” complex served to coordinate labor in new ways, channeling wealth and power to those communities that participated in the new order. It is safe to say that that the organizational transformations beginning in the 14th century BC effectively catalyzed a competitive process involving labor, trade, and conflict that accelerated for more than 1000 years, ultimately resulting in the great cultures of Pukara, Taraco, and Tiwanaku.

Tracking the development of this cultural trend allows us to monitor the emergence and consolidation of complex societies in the south central Andes, and, as discussed in Chapter 2, parallels similar processes around the world. Yet, there is a broad question that remains: how and why did the Kalasassaya complex develop in the northern Titicaca Basin? More specifically, why do only a handful of sites with this architecture remain in use by the early part of the Upper Formative? A review of early political centers in the region sheds light on the empirical patterns in the evolution of this phenomenon and helps define the factors and explain the processes that both generated and sustained this evolutionary cycle.

4.3 Empirical patterns of the Middle and Upper Formative Periods

It is significant that the innovations in village life appear as a suite of interrelated features during the 14th century BC. Importantly, this complex includes the developments associated with the Yaya-Mama religious tradition: sunken courts, fancy pottery, a stone sculptural tradition, and so forth. Moreover, Middle Formative Qaluyu-style pottery is remarkable for its well-fired *tazones* (flat-bottomed bowls) that, given their large size and elaborate decorative embellishments, most certainly were used in some kind of communal food sharing activities. In the aggregate, the entire complex of new features marks the inception of a political ritual/feasting phenomenon that revolutionized the regional political economy. Elsewhere (Levine, et al. In Press), I have argued that the successful adoption of this complex lent a competitive advantage to certain kin groups in certain centers, allowing them to attract more followers, which, in turn, allowed them to build larger and more complex labor organizations. Perhaps due to inherent ecological or geographical advantages, these villages then continued this generalized competitive process through time.

4.3.1 Early corporate architecture

The sunken court tradition of the Lake Titicaca Basin persisted for over two millennia; ultimately taking the monumental forms that can be seen at the sites of Pukara and Tiwanaku (Bennett 1934, 1936; Kidder 1943, 1956). In her dissertation, Amanda Cohen (2010) presents a detailed summary of the development of sunken court architecture and discusses its role in the lives of early residents of the Titicaca area. She argues that during the Middle Formative Period, sunken courts “came to be the architectural focus of a suite of features known collectively as the Yaya-Mama religious Tradition” (Cohen 2010:47). Semi-subterranean courts and associated structures

were the site of religious ceremonies and activities, and may have been used to store the ritual paraphernalia associated with the Yaya-Mana religious tradition, discussed in Chapter 3 (Chávez 1988). Prior to Cohen's study, other researchers had offered varying explanations for their use, none of which are really mutually exclusive. Those inclined towards functional explanations suggested that courts provided a venue for the congregation of large numbers of people. As such, these structures may have served to house all means of politically motivated social events, including feasts (or competitive feasting) and the exchange of goods (Burger 1992). Courts would have also been a prime setting for the display of monoliths and other types of lithic art (Ponce Sangines 1990). Other scholars advocated a more ceremonial or religious purpose for the courts and associated structures. Around the Titicaca Basin, such structures have been interpreted as locations of ritual activities and offerings (Kidder 1948; Mujica and Wheeler 1981), or as funerary monuments for the storage of mummies (Isbell 1997). Despite the wealth of attention sunken courts throughout the basin have received over the years, Cohen notes that these studies have not succeeded in determining the significance of the courts to the process of increasing sociopolitical complexity (2010:50).

In order to fully comprehend the significance of this form of corporate architecture, it is first necessary to trace its development from the earliest known examples. The first corporate courts in the Titicaca Basin were somewhat rudimentary. At the site of Huatacoa, located in the Pukara valley, Cohen discovered one of the earliest sunken court constructions to date (see Figure 3.1 for site locations). Huatacoa is located across the river from the monumental center of Pukara, and the latter's imposing terraces are visible from the site. Measuring approximately 3 hectares in size, Huatacoa is composed of a large principal mound with a central depression. Dating to the 14th century BC, the earliest sunken court at Huatacoa was trapezoidal in shape

and contained unlined pits that were filled with ash, features that Cohen interpreted as loci of repeated burning. The sunken court was also associated with a yellow clay patio floor that was characterized by “heavy in-situ burning across all areas excavated” (Cohen 2010:156-157). These finds led her to suggest that the patio surface was the focus of ritual activity. However, the construction of this complex may have been somewhat informal; while a prepared platform was located adjacent to the court, no external wall marked the perimeter of the patio space.

The site of Cachichupa (HU-14), excavated by Aimée Plourde in 1999, was likewise an important regional center for the far northeastern Titicaca Basin during the Middle Formative. Located in the Putina valley, Cachichupa boasts a series of courts located at the base of a hill. A number of large terraces loomed over the entire settlement. Plourde’s excavation of these terraces yielded a pit containing a cache of smashed Qaluyu finewares, including large serving vessels embellished with Yaya-Mama style motifs. The date of this event was more or less contemporary with the construction of the courts at Huatacoa (Plourde 2006). She also suggests that these terraces—specifically Terrace K—seem far too large to have been built for solely agricultural purposes. Terrace K is monumental in size, measuring 40 meters in length and 20 meters in depth. At the time of construction, it approached 5 meters in height. As with Huatacoa, a thick surface of yellow clay was discovered near the modern surface of the terrace. This feature represents important evidence for the non-utilitarian use of the terraces; in addition to the data from Huatacoa, at Chiripa, the preparation of floor surfaces with yellow clay was commonly used to designate these areas as special purpose structures. These terraces at Cachichupa would have been highly visible to the people below, and along with the sunken courts, constituted the corporate architectural elements at this early Middle Formative site.

To the south, in Bolivia, there are several other examples of very early sunken courts, including the Choquehuanca and Llusco structures at Chiripa. These structures, dating to 1000 BC and 800 BC, respectively, were investigated by the Taraco Archaeological Project (TAP), directed by Christine Hastorf. The unroofed, semi-subterranean Choquehuanca enclosure was trapezoidal in shape and oriented along cardinal directions. The artifacts associated with the structure suggest a focus on food consumption, including the imbibing of *chicha* beer. No evidence for burning was found on the floor surface, which had been plastered with yellow clay; however a niche on the eastern side of the enclosure may be indicative of religious or ceremonial activities, and perhaps represents early evidence for ancestor presentation (Hastorf 2003). Similar in form and size, the Llusco structure was also likely a locus of ritual and food consumption. Decorated ceramics were discovered scattered across the partially preserved white plaster floor; these included a well-preserved trumpet fragment, as well as pieces of braziers. Fragments of cooking and serving vessels were also discovered (Steadman 1999). A distinguishing feature of the Llusco enclosure is a stone-lined canal located in the structure's northwest corner. The small size of the canal precludes the movement of substantial amounts of water, and Hastorf infers a ritual purpose for the feature. Similar rituals surrounding water movement in canals have been well documented throughout the Andean area, most notably at the iconic sites of Chavín de Huántar (Lumbreras 1989) and Tiwanaku.

Other survey and excavation work in the south Basin has documented a number of early courts in other areas of Chiripa and at Kala Uyuni, on the Taraco Peninsula, Allkamari and Ch'jini Pata, in the Tiwanaku valley, Titimani, in the eastern Basin, and Palermo, in the western Basin (Bandy 2001; Cohen 2010). Kala Uyuni, also the focus of excavations by TAP, provides important data about the development of non-domestic architecture in the southern Titicaca area,

as this site was a major Late Chiripa site on the Peninsula, and one of a handful that became a major political center during the Late Formative. The Achachi Koa Kkollu sector of Kala Uyuni was first identified by Bandy during his survey of the Taraco of Peninsula (Bandy 2001), and was later excavated during the 2003 field season (Cohen and Roddick 2007). This work revealed two stone-lined sunken courts that were trapezoidal in shape. The excavation of the “Upper Court,” located to the east, yielded an *in situ* sandstone monolith that was still standing in the center of the enclosure, as well as a stone pestle that was carved in the Yaya-Mama style. Both of these courts had undergone several episodes of extensive remodeling and expansion, a discovery that is perhaps indicative of residents’ shifting needs over the duration of the structures’ use-lives. Also significant is that fact that the two courts of the Achachi Koa Kkollu sector likely formed a cohesive unit; in addition to their close proximity, the structures were simultaneously in use and shared similar architectural styles. Cohen and Roddick argue that the size of these enclosures makes them the largest known courts of the Middle Formative, though Hastorf (2003) has suggested that the sunken court within the Mound at Chiripa may actually have been larger.

Over the course of the Middle Formative, courts became larger and more elaborate in their scale. Bandy’s survey of the Taraco Peninsula (2001) identified a number of Middle Formative sites with public architecture, and his data indicate that these architectural forms became larger and more complex over time. Cohen (2010) attributes these developments to an increase in the size or in the numbers of groups that interacted with them, and suggests that such elaborations likely represent a greater investment in skills or resources. It is also likely that during this period, courts were present at almost every site, and were probably associated with small local chiefdoms or kinship groups (Cohen 2010:49).

4.3.2 Upper Formative innovations

The development of complex, territorially expansive polities defines the Upper Formative from 500 BC to AD 400. This period saw the dramatic intensification of the features of the Kalasasaya complex. Specifically, there are significant developments in the sunken court complex during the Upper Formative Period. Courts not only become larger, but also are suddenly restricted to selected larger sites—sites that ultimately developed into the region's earliest major regional centers. During this time period in the southern Titicaca area, courts have been documented at only a few sites, including Chiripa, Waka Kala, and Khonkho Wankane. Courts have also been found at Incatunuhuri and Cerro Chincheros, in the western Basin.

In the northern Titicaca region, two sites stand out from the others during the Upper Formative: Pukara and Taraco. Pukara, introduced in Chapter 3, is one of the most famous sites in all the Andes and dates from circa 500 BC to AD 400. This monumental site occupies an iconic status, as it is one of the first sites described in the ethnohistoric literature nearly 500 years ago (Cieza de León 1959 [1553]), however the exact nature Pukara has been intensely debated (see discussion in Klarich 2005). The site has long been recognized as a major civic and ceremonial precinct and it was the primary central place in the region by the end of the Upper Formative (see S. Chávez 1992; Klarich 2005). The site of Pukara is located along the Pucara River in the northwestern Basin, approximately 80 kilometers from the lake, at the base of an imposing sandstone outcrop (Klarich 2005). Modern research indicates that it is at least 1.5 km² in size, with three huge sunken courts and about a dozen smaller, unexcavated courts located on an imposing hill rise. A large and historically quite deep series of middens in front of the court complexes indicates that the site was also home to a large resident population that lived and worked in this pro-urban center (Kidder 1948; Klarich 2005). By 500 BC, Pukara was producing

a distinctive, elaborate art style; however, by no later than AD 400 construction of the site had ceased, along with the production of its distinctive material culture (Mujica 1987; Plourde and Stanish 2006).



Figure 4.1. Sunken court complex at Pukara

Sergio Chávez (1992) suggested that Pukara was a ceremonial center whose power relied on leaders' abilities to control the production and distribution of supernatural imagery.

However, more recent regional survey has indicated that Pukara was not simply a ceremonial precinct with uninterrupted control of the northern Basin; rather, it came to power out of a context of factional competition and shifting alliances (Cohen 2010; Stanish 2003). The appropriation of ideological power was likely an important component of Pukara's success, but this was not its only pathway to power, nor was it a novel approach. The site's multiple sunken courts, standardized suite of icons, and fine ceramic and lithic art styles were elaborations of

earlier Middle Formative leadership strategies designed to entice local populations and pilgrims alike, attracting them away from competing settlements.

Taraco, the focus of this dissertation, was described by Kidder (1943) in his survey of early sites in the northern Titicaca area. The archaeological site is located on the *pampa* along the Rámis River in the modern-day town of the same name.³ Today, the highway between Juliaca and Huancané runs through the site area, and just as in antiquity, the modern town remains a hub for local political and economic activities. Reports of monoliths at Taraco, specifically a “number of human figure statues and stelae,” had initially attracted Kidder to the lower reaches of the Rámis River in search of evidence for an early occupation. The most obvious signs of such an occupation were two very large cut stones, a worn—or perhaps unfinished—stela, and a broken stela, which were seemingly concentrated in the northeast area of the town. A number of other monoliths carved with various motifs were discovered in the main plaza. Kidder also documented substantial quantities of fine pottery scattered on the ground surface throughout the town, as well as a significant amount of obsidian debris. There is also evidence of an artificial mound or platform structure, upon which the modern church and some of the houses of the town are built. Based on the abundance of stelae found in and around the modern town, and the evidence of fine pottery and possibly stone carving, Kidder speculated, “Taraco must have been a rather extensive and important center” (1943:17). As will be discussed in later chapters, this idea has been substantiated by a wealth of recent research.

Located 2.5 kilometers to the west of Taraco along the river is the archaeological site of Saman, again located in the eponymous modern town. Given its close proximity, it is likely that the site was part of the Taraco site complex during the Upper Formative Period, forming what

³ The north Basin town of Taraco (on the Peruvian side of the lake) should not be confused with the town of Taraco located in the southern Basin, on the Bolivian side of the lake.

Kidder described as “a single scattered settlement with ceremonial centers at various points” (1943: 18). Like Taraco, a number of carved stone blocks are on display in and around the main plaza, and several cut sandstone blocks have been excavated from the ground near the plaza. Adjacent to the modern town of Saman is the site of Chaska Moq’o. Documented during survey of the Taraco-Arapa region, this site has at least three distinct sectors and at least one sunken court. Surface collection around the hypothetical sunken court yielded both Qaluyu and Pukara style incised ceramics, indicating a relatively high status and possibly a ritual function for this area.

4.4 Modeling the emergence of regional centers in the Titicaca Basin

Whether one views such architecture as having integrative effects to deal with stress (e.g. Flannery 1972), promoting community cohesion (Bandy 2004; Hastorf 2003), or reinforcing social inequalities (Abrams 1989; Cohen 2010), the Kalasasaya complex is central to the development of increasingly cooperative and complex forms of social organization. It is clear that settlements containing such monumental architecture can attract followers through the production and distribution of ideology through rituals, feasts, and the dissemination of goods depicting supernatural imagery (DeMarrais, et al. 1996). For visitors, participation in these events conferred a measure of prestige—signaled, in the words of Plourde (2006), by newly acquired symbolic materials and specialized knowledge—that could be parlayed into power strategies (*sensu* Blanton, et al. 1996) in their nascent communities. The promise of prestige and status would lure these individuals into long-term reciprocal debt obligations (Hayden 1998), thereby establishing a large coalition of supporters for the aspiring center (Clark and Blake 1994).

Such a theoretical framework allows us to understand the Kalasasaya complex as representative of the persuasive means by which aspiring elites enhance their factions and maintain the complex labor organizations that the members of these factions participate in and perpetuate. The ethnographic record is full of examples of chiefs conducting feasts in special or sacred places as a means to maintain their factions. In the absence of coercion, elites can only maintain their status by conforming to norms of reciprocity; if a chief acts “unfairly,” perhaps by failing to provide the necessary material incentives, followers will defect, effectively leaving the center powerless (Stanish and Hayley 2005). The political economy of such chiefly societies effectively merges the ritual and the economic by creating a culturally implicit set of rules that all members understand. A full range of reciprocal obligations between chiefs and their supporters are negotiated during special times in these special central places. Corporate architecture is the place where such negotiation takes place and serves to make some of these rules explicit (see Cohen 2010). Communities that create the place to successfully negotiate complex rules of economic behavior and social cooperation will, in the long run, dominate the political landscape.

A central theoretical question emerges from these data: what are the factors that can explain the relatively rapid emergence of regional centers in the Basin, as represented in the archaeological record by the Kalasasaya complex? The factors hypothesized here are labor organization, trade, and the use of conflict. These factors played out in a geographical context that favored the agriculturally rich far northern and southern Titicaca regions. In the north, this region was centered in the corridor along the lake and up the rivers from Huancané through Taraco, Azángaro, and Pukara. In the south, this region is bounded by the Pampa Koani through the Taraco Peninsula, Tiwanaku, and the Jesus de Machaca region.

4.4.1 Labor organization

As summarized in Chapter 3, the reorganization of labor is a critical factor in the development of increasingly complex forms of social organization. Economic anthropological theory teaches us that it is not the sheer amount of time spent in productive activities, but rather it is the *nature* of labor organization that is capable of creating politically powerful and wealthy societies in pre-industrial economies. Keeping politically autonomous groups cooperating in economies of scale is the key to understanding how such rapid transformations can occur. These transformations can take the form of rapid growth, as well as rapid decline. Cross-culturally, the cycling of chiefdom and archaic state complexity appears to be the norm. Textbook smooth evolutionary transitions, as would be implied by early models of cultural evolution, appear to be more an artifact of our theoretical biases and incomplete data sets (see Anderson 1996; Marcus 1998).

In the Titicaca area, the construction of non-domestic architectural features in these kinds of cultural contexts represents, in the most general sense, a physical manifestation of cooperative labor efforts, new forms of labor management, and the creation of economies of scale. In the revised system, people do not work *more*; they work *differently*. For the first time, labor also becomes a commodity, and the contribution of work-hours (whether voluntary or coerced) may be compensated with access to restricted goods, feasts, and/or other ceremonial activities. This labor would have been used to “build and maintain sunken courts, to maintain part-time artisans to produce the stone and ceramic objects...and to mount trading expeditions outside the region” (Stanish 2003:280).

During the Formative period, both access to and control over labor were important avenues to power. Of particular interest is the construction and maintenance of raised fields, which represent an intensification of agricultural activities as well as a shift in the nature of labor

organization. Although raised field farming is labor intensive, it presents many advantages that were likely significant to the growth of certain sites. By absorbing and conserving heat from solar radiation, these systems protect growing plants from frost damage during the cold—often sub-freezing—*altiplano* nights (Erickson 1985; Kolata 1991). These properties, together with splash irrigation from the perennial water supply, serve to shorten fallow periods and offset the agricultural cycle by as much as two months from the traditional dry land cycle (Bandy 2001). As such, raised fields permit the generation of surplus through double-cropping or allowing time for other types of activities (Janusek 2008). As such, raised fields represent an important strategy for the maximization of labor efficiency (Bandy 2001:296). Settlement data from the Island of the Sun, the Juli-Pomata region, and Huatta Pampa suggest that raised-field agriculture likely came into use during the Middle Formative Period, forming perhaps as much as one-third of regional political economy during this time (Erickson 1988, 1993; Stanish 1994, 2006). As documented during survey of the Juli-Pomata area, these systems were expanded during the Upper Formative such that nearly 70 percent of the population was living less than a 10 minutes' walk from the raised field areas (Stanish 1994, 1997, 2003). It may be argued that the survey data indicate the mobilization of labor for the intensification of supra-household agricultural production.

Terraces are likewise representative of intensive cooperative labor efforts. Terraces are an extremely effective agricultural innovation and can be seen throughout the Andean Cordillera, as well as other mountainous areas of the world. Their primary purpose is to expand the amount of land available for cultivation by creating flat surfaces on uneven or steep terrain, and they also help to retain water while preventing erosion (Plourde 2006). Settlement data from the Island of the Sun and the Juli-Pomata region suggests that the practice of terrace construction dates as far

back as the Middle Formative (Bauer and Stanish 2001; Stanish 2003). Data from the northeastern Basin indicate a similar pattern—Plourde’s excavation of the terraces at Cachichupa yielded dates between 1500-1130 BC, placing the construction securely in the Middle Formative. As mentioned above in the discussion of Cachichupa, it is significant that while terraces were (and continue to be) undeniably useful for their ability to optimize available resources, the massive scale of certain terraces suggests that some of these agricultural features may have served as monuments themselves.

From this perspective, the Kalassasaya complex represents the physical means by which labor is mobilized in societies lacking elites who possess coercive power. In the absence of a coercive system of leadership, aggrandizers and aspiring elites must use persuasive means, rather than violence (or the threat of violence) to compete for factions and convince their followers to cooperate with non-kin. Such non-coercive means of leadership include scheduling and hosting feasts, as well as providing tangible and/or ideological benefits in return for the labor hours spent working in any of the myriad aspects of their labor organization. The role of corporate architecture in the development and maintenance of ever-widening social networks—critical to the long-term economic and political success of a community—cannot be overstated.

4.4.2 Trade

There is abundant evidence for long-distance exchange of commodities throughout the Titicaca region as early as the Archaic period. Obsidian is the earliest known exotic material to enter the Basin, appearing in small quantities at the site of Quelcatani as early as the Middle Archaic (Aldenderfer 2002; Plourde 2006). Its presence is highly significant, because it is imported in ever increasing quantities despite the widespread availability of high quality cherts in the region

(Aldenderfer 2002). Excavations on the Island of the Sun in Bolivia indicate trade in obsidian and basalt from as early as the latter part of the third millennium BC. This obsidian had been transported from the Colca valley in the Arequipa area, more than 175 km away. This find is doubly significant because such trade would have required the use of watercraft, since the island has been a geographically separate entity for most, if not all, the time of human occupation (Stanish, et al. 2002).

By the early Formative Period, the long-distance exchange networks required for the acquisition of prestige goods had been firmly established (Janusek 2008). Early residents of the Titicaca region utilized a host of exotic goods. The earliest gold artifacts in the basin, discovered at the site of Jiskairumoko, date to this period, and possibly earlier (Aldenderfer, et al. 2008). This rare material would have likely come from the eastern valleys that descend towards the Amazonian Basin, as the Titicaca region contains very little of this material (Plourde 2006). The excavations at Jiskairumoko also yielded the earliest evidence of a non-local blue stone in contexts dating to the early Terminal Archaic (Craig and Aldenderfer 2002). This stone, alternatively identified as lapis lazuli or sodalite, was fashioned into beads used in personal adornment, and may have been imported from a source in Cochabamba, south of the Titicaca Basin (Browman 1981). A variety of hallucinogenic plants and other organic materials, including *coca*, *ayahuasca*, and *brugmansia*, grown in the Amazonian lowlands and tropical eastern slopes, were used in conjunction with snuff tubes and tablets, which were also traded (Janusek 2008; Plourde 2006).

There is also solid evidence for the existence of intra-regional trade networks during the Formative. Bandy has traced the movement of andesite artifacts during the Middle Formative Period. This material is exotic to the southern Basin, and the only documented quarries are

located in the Chucuito area along the western margin of the lake (Frye and Steadman 2001).

Agricultural implements (hoes and adzes) manufactured from this stone, found at sites along the south sides of the lake, were, by necessity, procured through exchange with northern populations.

Through participating in trade networks, aspiring leaders accumulate the resources required to finance large-scale cooperative projects and events. These include not only the construction of corporate architecture, but also agricultural projects, feasts, ceremonies, and so on. Trade introduces external resources into a group, which, along with conflict, fuels internal faction-building and political expansion. From an evolution of cooperation perspective, trade is a form of cooperative interaction, and it follows that a group's successful negotiation of exchange relationships is an index of its level of within-group cooperation. In evolutionary terms, increased within-group cooperation is the key to the formation of larger and more complex forms of social organization. It is not simply that the acquisition of resources allows for the expansion of the political economy, but also that groups that can successfully organize long-distance trading expeditions, or can collectively create the venue for the local exchange of materials, are at a distinct advantage over their competitors. Groups (as defined in Chapter 2) that regularly engage in trade can expand their networks and extend their influence by enhancing their villages with non-domestic architecture, hosting feasts, brokering marriage alliances, and generating reciprocal debt obligations. Effectively, wealthy groups can "buy into" the Kalasasaya complex, and finance the activities that transpire within. These demonstrations of power, in the absence of coercive force, may serve to convince other communities to participate in larger cooperative social networks.

4.4.3 Conflict

Historical documents indicate that the Inka occupation of the Titicaca area was brought about through military conquest and intensive negotiation. Like the rest of the Andes, conflict in the region had been widespread in the preceding Late Intermediate Period (Arkush 2005; Arkush and Stanish 2005). However, evidence of organized violence at the other end of the chronological sequence is not quite as clear. Plourde and Stanish have identified some settlement pattern evidence that sites were defensively situated as early as the Middle Formative; however these data are not entirely secure. Evidence for conflict and cooperation becomes clearer in the archaeological record of the Upper Formative, and it may be argued that organized conflict can be traced to at least this era. Archaeological surveys conducted throughout the northern Basin have discovered Formative ceramics on defensively located sites and on sites whose walls were unequivocally defensive (Arkush 2005; Stanish and Umire 2004). Such fortified hilltop sites, known as *pukaras*, are generally associated with the Late Intermediate Period occupation of the Basin, but recent research has suggested that they are not exclusive to this era. Test excavations by Arkush at the hilltop site of AS1 (Calvario de Asillo⁴), located near the modern town of Asillo, yielded diagnostic Middle Formative ceramics, and produced a radiocarbon age of 800-520 BC (Arkush 2005:722). During the same survey Middle Formative pottery was recovered from the *pukara* P37, and a Yaya-Mama style monolith was discovered on the surface of PKP7 (Plourde 2006:286). A single radiocarbon date from the base wall of a fortified site in the Putina valley dates to the Upper Formative, circa 108 cal BC-120 cal AD, which is consistent with the Upper Formative period defensible locations in the northern Titicaca Basin in general (Levine et al. in press).

⁴ AS1 is alternatively identified as Machu Asillo or Karqani. Notably, the Spanish chronicles mention this place as one of the locations where the Collas fought the Inkas (Arkush 2005:364).

There is a significant iconographic shift circa 500 BC that speaks to the regular use of violence as a political strategy. Pukara's iconographic repertoire, which includes trophy heads, "devourers," decapitators, and snarling, kneeling felines, alludes to an ethos of violence and unequal power (Hastorf 2005:68) never before seen in the Titicaca region. Iconography on carved stone stelae, textiles, and pottery depicts people who appear to be valued for their military prowess (Chávez 1992). Of particular interest are representations of "trophy heads" (Arnold and Hastorf 2008; Chávez 1992), which had been conspicuously absent from the Yaya-Mama imagery of the Middle Formative. By the Upper Formative, this motif appears "in stone, ceramic, and textile arts, and its symbolic power in the region cannot be overstated" (Stanish 2003:161). The use of these types of images likely reflects actual conflict among elite groups in the region at this time.

Other data also suggest elevated levels of political unrest at this time. During the excavations at Huatacoa, Cohen unearthed trophy heads in association with the Late Qaluyu occupation, which dates to well after 400 BC (Cohen 2010:205-209). Moreover, Arnold and Hastorf argue that the cache of curated human heads found by Kidder at the site of Pukara (Chávez 1992:64; Kidder 1943) likely represents "the capture of enemy powers" (Arnold and Hastorf 2008:190-191). Together, these lines of evidence suggest that organized violence as a political tool began by at least 400 BC in the northern Titicaca area, though future research will undoubtedly refine this hypothesis. It must also be noted that similar evidence for conflict and violence has not been documented for the southern Titicaca area.

It hardly seems coincidental that these developments occur alongside a major shift in the north Basin settlement pattern. By approximately 2000-2500 years ago, several large regional centers had developed in the northern Basin. These include Pukara, Balsas Pata, Qaluyu, Cancha

Chancha, Arapa, Huancanewachinka, and Taraco. Qaluyu, with its deeply stratified deposits, became the type-site for the pre-Pukara cultures of the region. Covering approximately 15 hectares, the site has a series of elaborate sunken courts. Judging from the massive slabs scattered across the site, the interior of these courts were likely faced with carved stone blocks. Balsas Pata, Huancanewachinka, and Cancha Cancha were similar in size and complexity to Qaluyu. Salvage work by the National Institute of Culture in 2009 in the town of Arapa discovered dozens of stone stelae and carved heads in the Yaya Mama style. By 400 BC, the northern Titicaca area had changed significantly; it was now characterized by a multi-tiered settlement pattern with large political centers spaced approximately 20-25 km apart. Numerous smaller centers, with only one or two sunken courts, were also distributed over the landscape, along with subsidiary villages and hamlets. The one exception to this trend is the site of Qaluyu, which is located only 4 km away from Pukara, and may represent a part of the larger settlement complex in that area. It may be hypothesized that as sites competed for resources, public architecture served to advertise the community's formidability—after all, the construction of such monumental structures would have required both access to a relatively specialized labor force as well as the resources to finance the actual construction process.

4.5 Summary

The rise of complex political organizations in the northern Titicaca Basin began around 1400 BC with the construction of a few modest sunken courts. These courts were likely the first public or “corporate” centers of political and ritual behavior, and were designed to facilitate and maintain cooperative behavior among social groups, among other things. This cooperation ultimately extended into both economic and political spheres, including the development of local and long-

distance networks of trade and exchange. By the middle of the first millennium BC, these architectural features, termed the Kalasasaya complex, became quite elaborate. An entire suite of objects, buildings, and behaviors coalesced into a coherent strategy to maintain high levels of social cooperation. At the same time, some groups were able to use their high levels of within-group cooperation in a decidedly non-cooperative manner against other groups; these groups were able to organize their factions to conduct raiding and trophy head taking on a regional scale. The development of organized conflict, along with the participation in long-distance trade networks and the ability to organize large-scale labor efforts, likely served as a tool for complex alliance building within and between settlements. Although several political and economic centers emerged during the Middle Formative, by the end of the first millennium BC, only two remained. These two sites, Taraco and Pukara, were competitors, with the latter ultimately prevailing in this regional struggle. This success was ultimately short-lived, as within only two or three centuries, Pukara itself collapsed, and the ensuing political void provided the context in which the early Huaña cultures emerged. The next several chapters will trace the emergence and development of Taraco as a regional center, and will explore why its adversary ultimately succeeded in the competition for regional dominance.

CHAPTER 5: TRACING THE DEVELOPMENT OF A REGIONAL CENTER: PROYECTO ARQUEOLÓGICO TARACO

5.1 Introduction

This chapter outlines the research design, including the chronology and research methods, of Proyecto Arqueológico Taraco. Two seasons of archaeological excavation at the site of Taraco, followed by intensive analysis of excavated materials, aimed towards understanding of the site's position in the history of the northern Titicaca Basin. Specifically, this research sought to investigate the processes by which village-level societies aggregated to form large cooperative social networks based at large, non-urban political and economic centers during the late Middle and early Upper Formative Periods.

5.2 Setting

The area that is the focus of investigation is located in the far northern Lake Titicaca Basin of Peru. The archaeological site of Taraco is situated on the *pampa* along the southern edge of the

Rámis River, one of the two major tributaries to Lake Titicaca, in the modern-day town of the same name. The modern town of Taraco is located approximately 14 kilometers due north of Lake Titicaca, in the District of Taraco, one of eight districts of the Province of Huancané, in the Department of Puno. The site sits at an elevation of approximately 3,819 m.a.s.l. (12,530 ft).

5.3 Taraco: background and previous research

It is no coincidence that the modern town of Taraco is renowned for the quantity and quality of its monoliths, many of which are carved with Yaya-Mama style imagery. As discussed in Chapter 3, the appearance of the Yaya-Mama religious tradition—characterized by a suite of features including a ritual assemblage, stone sculpture, and sunken court architecture—is associated with the growth and expansion of sites during the Middle Formative (Bandy 2006; Chávez 1988). The significance of Taraco in the history of the Lake Titicaca Basin has long been noted by scholars, including Tschopik (1946), Kidder (1943), Chávez and Mohr Chávez (1975), Lumbreras (1968), Mujica (1978:303), Neira (1962) and Rowe (1942), who have discussed the site and its various examples of exquisite lithic art. Unfortunately, its position in the prehistory of the Titicaca Basin has long remained ambiguous, as it is often eclipsed by the impressive site of Pukara, whose stone-faced terraces and monumental architecture still stand today.

In the systematic survey of more than 1000 km² area in the Huancané, Putina, Taraco, and Arapa zones, the principal mound at the site of Taraco stands out due to its comparatively large size (Stanish and Umire 2004). The survey data also indicate a dense cluster of contemporary settlements, linked by a network of causeways and modern roads, in the area surrounding the modern town. Together, these mounds form the Taraco site complex (Figure 5.1), and as represented by the survey data, the entire area of Qaluyu and early Pukara

occupation totals well over 100 hectares. When considered in the context of survey data from the region, the size of the Taraco site complex—several orders of magnitude greater than any of its neighbors—make the site a likely candidate for the primary Qaluyu center, and, along with Pukara, one of two political centers competing for regional dominance during the early Upper Formative Period (Stanish, et al. 2007).

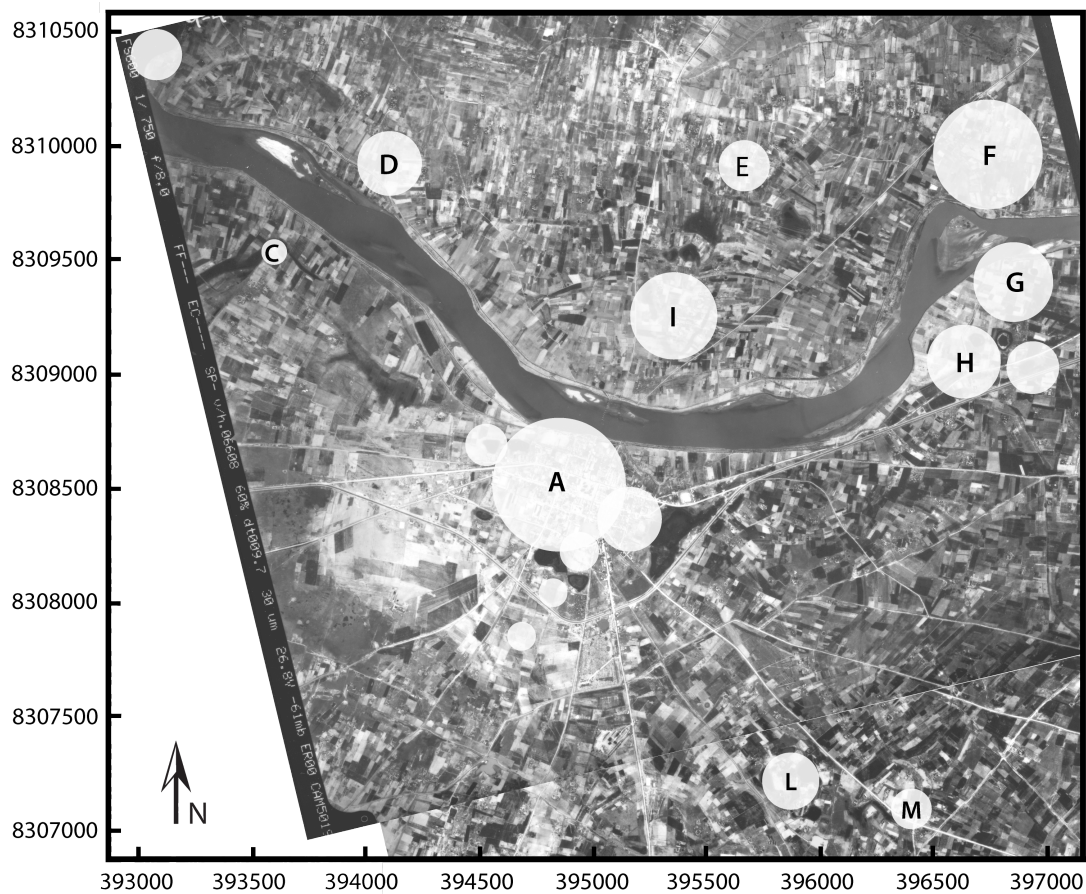


Figure 5.1. The Taraco site area

The analysis of obsidian artifacts excavated from Taraco by Sergio Chávez and Karen Mohr Chávez supports this idea. Geochemical characterization of these materials indicated that a “significant quantity” (16%) of the obsidian artifacts excavated from “immediately pre-Pucara” levels at Taraco could be traced to the Alca source, an obsidian source primarily used by the

populations of the Cusco area (see Craig, Speakman, et al. 2010:Figure 1 for locations of major and minor obsidian sources in the central Andes). As residents of the Titicaca Basin generally exploited obsidian from the Chivay source in the Colca valley (Burger, et al. 1998), they consider the presence of Alca obsidian as a proxy for the intensity of exchange with the Cusco area. As the percentage of Alca obsidian is a “quantity never occurring before nor equaled after this period there,” they suggest that “Taraco may have attracted people and their resources from Cuzco in pilgrimage to this evidently major public center” (Burger, et al. 2000:311-312).

5.3.1 Excavations in 2004

Test excavations in 2004 by Charles Stanish and Edmundo de la Vega represent the first systematic archaeological of the Taraco site area that have been made publically available (de la Vega 2005). They chose to excavate a 4 x 4 meter test pit in the center of an artificial terrace just below the highest part of the modern town (Figure 5.2). The excavation area, termed Area A, was selected for several reasons. River activity on the northern margin of the mound had indicated good stratigraphy in this part of the site. Area A also appeared to be a large platform that likely had been associated with the architectural center of the Taraco site complex. Based on the results of excavations of analogous platform mounds elsewhere in the Titicaca Basin, Stanish and de la Vega hypothesized that Area A would contain the elite architectural compounds often associated with the ancient sunken court. This hypothesis was substantiated, in part, by the significant quantities of Formative ceramics that covered the surface of the terrace, and also by the large cut stone blocks unearthed by the town’s residents, who had been excavating soil from the margin of the terrace for making mud bricks. Excavations sought to define the ceramic chronology and determine an occupational sequence for the mound.

Botanical, faunal, and lithic artifacts would also be assessed in order to test whether the surface data, recovered during regional survey, were representative of the subsurface contents.

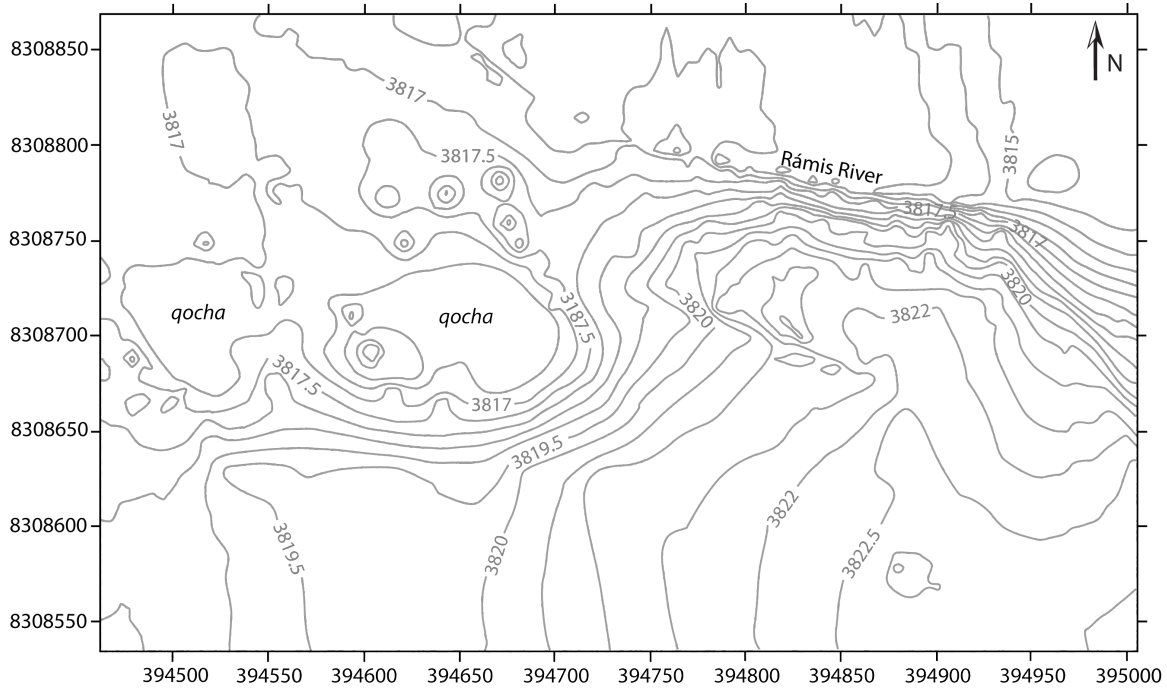


Figure 5.2. Area A (Patamoya) at Taraco

Their test unit (subsequently termed Unit I during the 2006 field season) revealed a stratified cultural sequence reaching nearly four meters in depth and dating to at least as early as 1100 BC.⁵ No materials suitable for radiocarbon dating was found in the earliest levels so unfortunately these could not be absolutely dated. These excavations yielded two architectural phases with fine stone buildings that were associated with the late Qaluyu and early Pukara occupations. These buildings were superimposed and were associated with fine quality artifacts, as well as burials of humans and llamas, which appeared to have been sacrificed. At the close of the early Pukara occupation, circa AD 50-240,⁶ the entire excavation area was burned. Post-burn

⁵ AA63324; charcoal.

⁶ AA63328; charcoal. For the date 1885 ± 40 the two possible calibrated age ranges are 29-38 cal AD ($p = 0.014$), and 51-233 cal AD ($p = 0.94$). Calibrated at 2- σ with the program OxCal 4.0.

levels were found to contain reduced quantities of exotic materials and poorer quality ceramics, and they lacked the major stone buildings of the earlier periods (de la Vega 2005).

Together, the recent survey, excavation, and analysis indicate that Taraco was an important regional center for north Basin Middle Formative societies. The site likely maintained this status into the early part of the Upper Formative Period. This finding is significant because the site of Pukara, located 50 kilometers to the northwest, has long been considered the earliest political center of the northern Titicaca area (Bennett 1948; Kidder 1948; Klarich 2005; Stanish 2003). The site of Chiripa (Hastorf 1999), located to the south on Bolivia's Taraco Peninsula, has been described as a model for the Pukara polity (Bennett 1948; Chávez 1988) due to similar architectural plans, construction features, and artistic styles (Bennett 1948; Kidder 1948). However, based on its larger size and greater complexity, in addition to geographic proximity, Taraco is a likelier predecessor to the Pukara polity than Chiripa, and, as such, an excellent case for testing models for the emergence of regional centers and developing socio-political complexity.

5.4 Research design

The results of the 2004 excavations support the hypothesis that Taraco was a major regional center during the late Middle and early Upper Formative Periods, as had been suggested by the survey data, as well as previous observations and research. This means that out of the many relatively undifferentiated settlements that characterized the Terminal Archaic and Early Formative occupations, Taraco became one of a handful of sites competing for regional dominance by 400 BC. This finding begs two central questions: how and why did Taraco come to occupy such a powerful position in the northern Lake Titicaca Basin political landscape, while

other sites did not? In general anthropological terms, these questions look to explain why individuals (or groups of individuals) chose to relinquish autonomy in favor of participating in a larger cooperative social network. The theoretical literature on the evolution of social complexity and human cooperation, as well as the review of Formative centers presented in Chapter 4, suggests Taraco's florescence cannot be attributed to stochastic factors or historical particularism alone. Rather, the success of this regional center must have hinged upon a combination or confluence of factors—including trade, conflict, climate, labor, and ritual, to name a few—that have been consistently discussed for analogous centers worldwide. How these factors played out, and which proved to be most critical to Taraco's success, is the focus of this investigation.

With such a long, complete, and relatively undisturbed occupational sequence, Taraco presents an ideal case for testing models of cultural evolution that culminated in the development of a political and economic central place. In order to investigate how Taraco emerged as a regional center, it was necessary to formulate a methodology for Proyecto Arqueológico Taraco that was capable of charting the site's economic and political development over time. A multi-stage research program involving excavation, material analysis, and laboratory analysis was devised in order to accomplish this goal. The remainder of this chapter describes the aims and methods of fieldwork and analysis, and frames this work in the context of the general research design.

5.4.1 Excavation procedures

5.4.1.1 Logistics

Investigations of Area A resumed in 2006, and two excavation seasons, totaling five months of fieldwork, were carried out under the direction of Abigail Levine and Cecilia Chávez.

Permission to excavate was granted by the Instituto Nacional de Cultura of Lima, Peru. As Area A is private property, this work was conducted with the consent of the landowner, Daniel Huancollo. The excavation staff included archaeologists, students, *asistentes* (members of Programa Collasuyo with prior field experience), in addition to a regular field crew drawn from the local community of Taraco. Each excavation unit had a full-time supervisor, who was responsible for the management of unit operations, as well as documentation. Levine directed daily field operations.

5.4.1.2 Grid system and site mapping

As mapping equipment was not available during the 2006 field season, an arbitrary site grid was established, designating the southwestern corner of Unit I—the unit excavated by Stanish and de la Vega in 2004—as N100, E100. All coordinates for the location of units and other data (i.e., features, lots, and small finds) were measured from this central point during the 2006 field season. In 2007, a Trimble Pro XRS GPS unit was used to create a topographic map of Area A, as well as a number of the neighboring mounds. The site grid and all excavation units were also plotted on the site map at this time.

5.4.1.3 Methods of excavation and sampling strategies

Methods for excavation followed similar procedures of the 2004 field season (de la Vega 2005), as well as those outlined for similar projects in the region (Klarich 2005; Plourde 2006). A system of “nested” features was used to divide horizontal data into units, features, and lots (Plourde 2006:492). This system has been used successfully in other areas of the Titicaca region to maintain horizontal control of cultural materials (Bermann 1994; Plourde 2006; Stanish and Steadman 1994). Standard excavation units measured 4 x 4 meters, and their location was determined by the results of the 2004 field season, as well as surface topography and finds. These units were internally subdivided into contiguous 2 x 2 meter subunits, numbered 1-4. Units were named in sequence with a Roman numeral (beginning with Unit I from the 2004 field season), and were identified on the site plan and in field forms using the designation “U” (for Unit), its Roman numeral, the subunit number, and the coordinates of their southwestern corner. Test trenches, intended for the relatively rapid investigation of subsurface contents, measured 1 x 4 meters, with the subunits measuring 1 x 1 meter.

Excavation followed both natural and cultural stratigraphy. If strata exceeded 10 cm in thickness, arbitrary subdivisions were added to maintain vertical control over the excavated materials. In the deeper (older) levels, where changes in stratigraphy were not always immediately apparent due to the high amount of moisture in the soil (but were visible after exposure to the sun and wind), arbitrary subdivisions were added every 5 cm. So as to avoid any confusion, natural and cultural “strata” were assigned Roman numerals, while arbitrary “levels” were given Arabic numbers. The correlation between arbitrary levels and natural/cultural stratigraphy was maintained throughout the duration of each field season, and a full list of these relationships (for those not listed in the text) can be found in Appendix B. During the course of

excavation, five liters of soil from each excavation context (level, lot, or feature) were wet screened using fine mesh, and all other soil was passed through 0.5 cm (approximately 1/4 inch) galvanized metal screens. Features such as floors, hearths, pits, and burials were drawn in plan view and in cross-section, and five liters of soil were taken from each of these contexts as flotation samples (Bermann 1994; Klarich 2005). All artifacts from inferred primary depositional contexts were drawn and digitally photographed *in situ*. For methodological and safety reasons, the excavation surface of the units was progressively reduced as greater depths were reached.

Following completion of the 2006 field season, it was determined that Area A could not be sampled efficiently using random quadrants, owing to the depths of the cultural deposits. In order to accomplish this goal, a modified transect sampling strategy (Flannery 1976:68-72) was employed during the 2007 excavation season. This procedure involved the cleaning of two preexisting profiles located along the river edge. These profiles—created by river activity and the removal of earth to make mud bricks—provided transects of the mound; no additional excavation was needed to achieve this cross section. These profiles were made vertical with spades and cleaned with trowels in order to expose and record the underlying stratigraphy and features. In some cases, a portion of the transect was cut back and excavated downward, following natural and cultural levels and previously outlined procedures, in order to further understand the nature of the visible deposits (Flannery 1976). These transects were expected to yield good spatial data for Area A, allowing for a better understanding of the mound's stratigraphy, past activities, and site formation processes.

Materials recovered during excavation were separated by material type (lithic artifacts, pottery, bone, etc.), counted, and placed in bags with enclosed Tyvek tags that featured

provenience information, the excavator, and the date of collection. Each bag was assigned a unique number and recorded in the site register of materials, which listed each bag's material type and excavation context along with its identification number. Small finds and other artifacts found *in situ* were bagged separately from bulk materials recovered from the screens, and were assigned unique identification numbers. Project *asistentes* were responsible for preliminary field artifact counts and the maintenance of the bag registry.

5.4.1.4 Methods of recording data

Data from excavations were recorded onto a set of field forms. These forms were adapted from previous projects administered by the Asociación Collasuyo, and reproductions can be found in Appendix A. *Capa/Nivel* (Stratum/Level) forms served as the primary form for the recording of each excavation context.⁷ These two-page forms included basic identification information (location of the unit, associated features and lots), a description of the natural (type of soil, color, compaction) and cultural (what types of material were found, approximate densities of materials) composition of the stratum/level, as well its contextual associations. Notes on the excavation of the context, including a description of the relationship between excavated arbitrary levels and natural/cultural stratigraphy, were also recorded, in addition to any other observations. In addition to these written notes, the base of the level was drawn in plan view on the front of the form, which also contained spaces for the corresponding elevation data. Logs of excavated

⁷ In most cases, a new *Capa/Nivel* form was used for each arbitrary level excavated in each subunit. However, in cases where several arbitrary levels composed a single stratum, this mode of recording would have resulted in an overabundance of paperwork. In these special cases, the notes on these levels were consolidated onto a single form, which was used to record data from the entire stratum.

materials and associated graphics—digital photographs and drawings—were featured on the reverse of the form.

Rasgo (feature) forms were used to record information for archaeological features. These were especially useful, and complimented the Capa/Nivel forms because archaeological features are not always confined to a single level, stratum, or even unit. In addition to basic identification information, these forms included a description of the feature (suggested function, form, orientation, contents), its associations, and other observations. As with the Capa/Nivel forms, the form included material and graphics logs on its reverse side. Additional forms were used for registering samples of soil and radiocarbon that were taken from excavation contexts.

Other means were also used for the recording of excavation data. Unit directors were responsible for keeping field notebooks for documenting unit activities, excavation contexts, and preliminary interpretations (and in many cases, re-interpretations of previous judgments). These notebooks were filed at the Asociación Collasuyo in Puno at the completion of the field season. Digital photographs and drawings were used to create a graphic record of excavation data and field activities. In addition to visually documenting features and small finds, it was standard procedure to take photos and make plan drawings at the base of each excavated level. At the completion of excavation, the profiles of all units were drawn and photographed. Registers were kept in order to keep track of all the photographs and drawings for each excavation season. These lists were designed to facilitate cross-referencing with Capa/Nivel and Rasgo forms.

5.4.1.5 Archaeological preservation

A number of measures were taken to ensure the preservation of the archaeological remains found at Area A. During the course of excavation, no stone architecture was disturbed or removed in

accordance with the stipulations of the excavation permit granted by the Instituto Nacional de Cultura (INC). Any stone architecture exposed by excavation crews was left in place, resulting in a modification of the size and shape of the excavation surface. Following excavation, all units were backfilled. This was accomplished using the backdirt from each of the units. As all of the soil removed from each of the excavation units was screened, this fill should contain very few—if any—archaeological materials. Prior to backfilling, the units were lined with a blue plastic tarp. Excavated materials were transported to the laboratory facilities in Puno and processed according to the procedures outlined below. All excavated materials are currently stored at the facilities at the Asociación Collasuyo, which was granted a custodianship by the INC.

5.4.2 Laboratory procedures

All excavated materials were subject to a basic level of analysis, in accordance with INC regulations. All materials were sorted by material type, and those that would not be harmed by exposure to water (bulk ceramics, lithics, faunal remains, etc.) were washed. All artifacts were counted and weighed, and recorded in an inventory. A complete list of these materials may be found in the *informe final* (final report) for each of the excavation seasons (Chávez 2007, 2008b). Macroscopic analysis of selected materials took place in the laboratory at the Asociación Collasuyo located in Puno, Peru during a five-month laboratory season in 2008.

5.4.2.1 Ceramics

The analysis of pottery constituted a significant portion of the bulk material analysis. Pottery figures into multiple components of elite strategies. Finewares, such as trumpets, *incensarios*

(incense burners or braziers), and *tazones* (flat-bottom bowls; see Kidder 1943), are used in rituals and ceremonies, and serve as a medium for the transmission of images that reinforce elite authority and influence. Their presence and density serves as an index of ceremonial activity and status. Patterns of fineware discard, storage, and access were studied in order to examine the frequency and type of non-domestic activities that took place at Area A, and how these patterns changed over the course of the occupational phases.

Utilitarian ceramic wares, including cooking pots, undecorated bowls, and jars, were also subject to analysis. These provide an important index of domestic activities, specifically, the ordinary, yet exceedingly important processes associated with food production and consumption. Through the analysis of these pottery types, and by tracking their changes over time, it is possible to monitor both the nature and the scale of cooking, serving, and food sharing activities.

During each field season, excavated ceramics were transported to the laboratory facility in Puno each weekend, where they were cleaned and catalogued in preparation for inventory, and in some cases, analysis. Great care was taken to avoid mixing among the bags of ceramic sherds in the laboratory; this included keeping the Tyvek tag containing each bag's provenience data with the contents at all times, even during soaking and washing. Sherds were soaked for a minimum of one day to extract salts that had accumulated while underground. They were then washed with water and allowed to air dry. While some sherds showed evidence of charred or organic residues, these too were washed, as the recovery of residues for analysis was not among the goals of the current study. Delicate items, as well as those with ephemeral slips or painted designs, were not washed so as to preserve the integrity of the specimen and surface decoration. These artifacts were carefully brushed to remove soil. Following washing/cleaning, each bag of sherds was counted and weighed. All diagnostic sherds—primarily rims, bases, and decorated

body sherds, as well as also tools and musical instruments—were assigned unique specimen numbers⁸ and were labeled individually. Sherds that were found to be from the same vessel were glued together, though each retained its unique identification information. As reunited broken sherds resulted in a change in the overall count for the bag, this change was noted in the inventory.

The excavations at Taraco produced an exceptional volume of both diagnostic and non-diagnostic pottery fragments; therefore only specific contexts were selected for analysis. Procedures for general ceramic analysis focused on characterizing form- and use-related attributes for diagnostic sherds. Analysis of paste, defined here as the clay matrix plus any natural or added inclusions, was completed for both the diagnostic and non-diagnostic sherds from the selected contexts. The purpose of paste analysis was twofold. First, the analysis of paste is important in a technological sense, as the fabric of a pottery has a direct impact on its performance. For example, paste can affect the permeability of a vessel, as well as its thermal properties. Second, in the Titicaca Basin, paste is understood as an important chronological marker (Roddick 2009; Steadman 1994, 1995, 1999, 2007).

Information for shape, paste, finish, and use were recorded according to the functional typology developed by Cecilia Chávez during her analysis of the ceramics collected during the survey of the Huancané-Putina region (Chávez 2008a). This typology, as well as its application to the Taraco assemblage, will be discussed in further detail in Chapter 7. Information obtained from the formal analysis of diagnostic specimens was used to determine 1) individual vessel type and function, 2) the total number of vessel types represented, and 3) any differences in the

⁸ Specimen numbers for ceramics followed a standard procedure that was also used for other artifact categories. Specimen numbers were composed of the bag number followed by another number, which corresponded to a specific artifact within the bag. For example, the fourth diagnostic sherd recorded for bag TA-1907 would be labeled TA-1907-04. This facilitated all aspects of data management, including analysis, photography, drawing, and artifact storage.

densities of vessel types over time and space. Information from the paste analysis—both of diagnostic and non-diagnostic materials—was used to make inferences about vessel procurement and the nature of ceramic production.

5.4.2.2 *Lithics*

Excavated lithic artifacts were counted and weighed, and were classified into major typological categories: hoes, adzes, hoe/adze fragments, discoids, cores, grinding stones, projectile points, and flakes (Seddon 1994). The types and the frequencies of lithic artifacts were used to assess the nature of activities for each occupational phase, and identify any variation over time. When possible, raw materials were also identified for each of these artifacts. Additional analysis was performed on certain classes of lithic materials. Groundstone agricultural implements were analyzed by Amanda Garrison. These artifacts, made of fine-grained volcanic (FGV) stone (often andesite or basalt, but also rhyolite or dacite) provide an important index for the intensity of agricultural activities. Obsidian artifacts, including projectile points, flakes, and other debitage, from selected contexts were subjected to additional analysis, including geochemical characterization (see Chapter 9).

5.4.3 Monitoring economic and political activities

Excavation and bulk material analysis were followed by a series of specialized analyses that were specifically designed to monitor Taraco's economic and political activities over time. The objective of this phase of the research program was to chart the organization of the production and exchange of prestige craft goods. This phase of the research program was particularly

important to the study, as the craft economy, which includes the manufacture, distribution, and consumption of crafted goods (Costin 1991), is often cited as a fundamental aspect of increasing complexity. The production and exchange of these special objects has been closely linked to the development of regional centers, as has been postulated by a number of studies (Hirth 1996; Peregrine 1991; Schortman and Urban 2004; Vaughn 2006). Both the acquisition and accumulation of such objects represent an important source of prestige among aspiring elites (Plourde 2006), and their exchange plays an important role in the elaboration of social hierarchies (Brumfiel and Earle 1987; Earle 1997; Helms 1993).

As discussed in Chapters 2 and 4, trade was likely one of the factors responsible for the relatively rapid rise of complex societies in the far northern Titicaca region. Though scholars have inferred trade activity in the Titicaca region through the presence of non-local goods (see Chapter 4), we have yet to identify the nature of these exchange relationships. This is especially important for high-status craft goods, which were likely produced within the basin, and unlike exotic goods—i.e., obsidian or lowland organic materials—are not imported from a limited number of known sources. For exotic goods, it is insufficient to simply identify their presence in the Basin; rather, in order to monitor economic and political activities, we must also find ways to examine patterns of access, as well as intra-basin circulation and exchange.

There are many different models for trade, and we must keep in mind that different categories of materials probably circulated in different ways. Models of political economy consider the strategies of individual political actors and specify how economic control is linked to the development of political power (Brumfiel and Earle 1987; Chávez 1992; Hirth 1996; Johnson and Earle 2000; Stanish 1992). These models therefore stipulate that the production and distribution of certain goods may be restricted so as to prevent the “cheapening” (Hayden 1998:

33) of symbols, images, and rituals. Such a pattern has been demonstrated for the craft economy in the Nasca region by Kevin Vaughn and colleagues (Vaughn, et al. 2006; Vaughn and Neff 2000, 2004).

When goods constitute a critical part of the political economy, models of centralized production and distribution are appropriate. Power, in such a scenario, would have been inexorably linked to the direct control over the production and distribution of specific luxury or symbolic objects (Brumfiel and Earle 1987; Steponaitis 1991). Such control would have enabled aspiring elites to accumulate “durable wealth,” which could be used to build and foster social relationships (Hirth 1996). If a single location is the sole source of these coveted items, then leaders may have attracted followers by promising access to these goods, along with restricted knowledge and new experiences.

Support for models of centralized production requires evidence suggesting that elites were limiting the number of producers—those individuals who have the resources, knowledge, and/or permission to create these objects (DeMarrais, et al. 1996:18). In the case of pottery, for example, variability in an assemblage has been argued to be an index for the number of producers or production loci; fewer producers correspond with decreased variability and increased standardization (Blackman, et al. 1993; Costin 1991; Costin and Hagstrum 1995). In contrast, in the case of obsidian, in which production of a projectile point is accomplished through a sequence of reductive actions, a center with primary access to this import would be expected to contain the relatively large amounts of raw material and debitage (Blomster and Glascock 2011). Other locales, dependent on the center for the acquisition of points, would contain comparably less production debris or cortical material, as any productive activity would

be confined to retouching or the repair of broken points (Melson 2010; Perlès, et al. 2011; Seddon 1994).

In the Andean region, goods also circulated according to reciprocal obligations, as evidenced by the prevalence of complementarity models in the literature (Masuda, et al. 1985; Murra 1972; see also discussion in Stanish 1992). *Ayllu*-based reciprocity may have served to manage risk in areas of high environmental diversity such as the Andes (Murra 1972; see also Earle 1987b), and to maintain nested hierarchies (Albarracin-Jordan 1996a). Recent work in the southern Titicaca region by Hastorf, Bandy, and others (Bandy 2005; Bandy and Hastorf 2007) has indicated that some sites functioned as “transit communities.” Such sites occupied strategic locations along trade routes and cultivated relationships with passing caravans, providing safe passage, lodging, and provisions in exchange for “presents” of exotic goods (Bandy 2005). Due to their advantageous positions, these sites would accumulate wealth and concentrate exotic materials at a faster rate than their neighbors who did not assume hosting duties.

When producers only trade their wares with prescribed partners, it is likely that production occurs at a few locations representing a subset of the total number of sites. Such partnerships result in a multiplicity of producers in a region; however, the circulation of goods is patterned according to definite and complex rules of exchange (Malinowski 1920). Goods cannot be traded randomly or indiscriminately, nor are they subject to the principles of supply and demand. In this model of the craft economy, a number of sites would have been involved in the manufacture of high status craft goods. The products would then be distributed to many other sites. Importantly, this model of “semi-dispersed” production can be linked with at least two socio-economic processes already documented in the circum-Titicaca area—reciprocity models (Albarracin-Jordan 1996a; Murra 1972) and transit community models (Bandy 2005). In

the former scenario, a few sites may be involved in craft production, and the products would be traded away to sites in which production did not occur. In the case of the latter, crafts would be manufactured by, and distributed from, optimally located—and comparably wealthy—sites, which could afford to finance production.

In a context of dispersed production, locally produced craft goods, such as finely made ceramics, would be expected to be more variable than if they had been produced in a central location. Analysis of ceramic attributes—decoration, paste, and mineralogical and chemical composition—should therefore cluster the artifacts in to more groups (relative to centralized production, which generally results in a fairly standardized product) exhibiting relatively low levels of internal variability. For exotic goods, semi-dispersed production would mean that there were a number of sites with primary access to the imported materials. While the material correlates of primary access would be the same as that of centralized production, semi-dispersed production would mean that more than one site would yield this type of evidence. Critical support for this model would hinge on the existence of sites that lacked production debris and raw materials; in other words, sites that were the recipients of the finished products.

It is also likely that during the Formative Period, ideas, in addition to goods, were exchanged during periodic gatherings, events, and ceremonies. This idea represents a subtle, yet highly important facet of any discussion of widespread artistic traditions. It is likely that the icons or images found on pottery or other fragile commodities circulated via other media, but the goods themselves were produced locally (Conklin 1983; Cordy-Collins 1976; Druc, et al. 2001). In fact, several studies have highlighted how various ceramic traditions often influenced, and were influenced by, other artistic media. Specifically, textiles have been shown to be key agents in the transfer of iconography from one region to another (Cordy-Collins 1976). In the Andes,

the movement of ceramic objects, which are extremely fragile entities, is often impeded by the unique topography of the region. It is empirically obvious, however, that icons diffused thousands of kilometers from their point of origin.

Such was the case with Chávin iconography, for example, whose presence defines the Early Horizon. Although the center of this stylistic tradition is the site of Chavín de Huántar, high in the central Andes, examples of distinctly Chavinoid ceramics have been identified up and down the coast of Peru. Until recently, it was impossible to determine if these ceramics had been exported from the site of Chavín, or were locally made, high fidelity copies. Druc and colleagues conducted a compositional analysis of Chavín ceramics from the sites of Ancón and Garagay, two sites on the central coast of Peru near the modern day city of Lima. This analysis revealed that all the ceramics were locally made, and that there was little exchange between these sites, despite sharing a similar artistic tradition. This important finding lends weight to the textile hypothesis, which had been first suggested by Cordy-Collins (1976) nearly 30 years prior to the geochemical study. In the absence of any sherds that could be traced to Chavín de Huántar, it is likely that coastal production of Chavinoid ceramics was influenced by textiles bearing the painted designs of the all-important icons, such as those found at Karawa, located on the Paracas Peninsula. Despite local production, the use of certain forms and styles were used to signal affiliation with the ceremonial center.

If production occurs locally, rather than in any centralized or dispersed contexts, then objects such as high status ceramics should exhibit considerable variation in decorative styles and paste types, despite general similarities. Variability in the former should not be surprising, as it represents local artisans' interpretation and reinterpretation of regional style, despite the maintenance certain formal canons and traditions. This type of subtle—yet nevertheless highly

significant—variation has been well-documented by Christopher Donnan and colleagues who have identified several variants and “sub-styles” of Moche fine-line painted pottery on the North Coast of Peru. Donnan argues that some of these, such as the San Jose de Moro sub-style, can actually be traced back to specific Moche centers (McClelland, et al. 2007). Even more impressively, he attributes other variations—a change in the execution of a helmet, or the rendering of deer—to the hands of individual artisans (Donnan and McClelland 1999).

However, as demonstrated for the coastal Chavín ceramics, because people may copy templates (textiles, ceramics, lithic art, etc.), many attributes of locally manufactured craft goods may be macroscopically indistinguishable across production centers. Nevertheless, analysis of these objects should yield great variation in source material, especially for ceramic objects, which are often made from nearby clay deposits (Arnold 2000; Druc et al. 2001). For exotics such as obsidian, a scenario of fully dispersed production would mean that every site would have relatively equal amounts of raw material and debitage, as they all have equal access to the imported good.

Monitoring economic and political activities required additional examination beyond the level of the general artifact analysis. This analysis focused on the patterns of manufacture, distribution, and consumption of two categories of high-status goods that signaled wealth and prestige for the owner: the finely made, non-utilitarian ceramics used in rituals and ceremonies, and obsidian, a costly import.

5.4.3.1 Non-utilitarian finewares

As discussed in Chapter 3, a few Formative ceramic forms were associated with non-domestic activities. *Tazones*, *incensarios*, and trumpets are three of the forms that are most clearly

associated with rituals and ceremonies, and likely conferred some measure of status on their bearer. Trumpets, for sound, and *incensarios*, for smell, were used to create an important “sensory” experience for participants in rituals and ceremonies (Chávez 1985, 1988; Hastorf 2003:327). In the Titicaca area, large *tazones*, often highly decorated with paint and/or incision, were likely used during supra-household food sharing activities, such as the serving of important guests (Bandy 2005, 2007; Steadman 2007). Unlike obsidian and other materials exotic to the Lake Titicaca Basin, ceramics—even such finely made, comparably rare ceramics—can be produced anywhere there is a suitable clay source. Moreover, previous work on Formative ceramics has demonstrated that the bulk of ceramic manufacture occurred at a local scale (Roddick 2009). Nevertheless, there is robust body of evidence indicating that these three fineware types were exchanged among early residents of the Titicaca region and beyond. Examples of Pukara polychrome, for example, have been identified in the southern Basin at the sites of Tiwanaku (Bennett 1934) and Khonkho Wankane (Ohnstad 2007), as well as in such distant locales as Moquegua (Goldstein 2000), located near the south coast of Peru. For these reasons, these Qaluyu and Pukara-style finewares are ideal materials through which the Formative craft economy may be examined.

In order to evaluate the models for production and exchange outlined above, a sample of *tazon*, *incensario*, and trumpet fragments was subject to geochemical characterization. This work, funded by a National Science Foundation Dissertation Improvement Grant, specifically addresses some special conditions that are associated with finely made and highly decorated pottery. For ceramics that confer status or prestige, differentiating among the various models for production can be especially difficult. This is in large part because recent research has consistently shown that, cross-culturally, people tend to imitate the behavior of a majority

(Henrich and Boyd 1998), and of successful or prestigious individuals (Henrich and Gil-White 2001). These behaviors, among others, may result in high levels of similarity in surface treatments, decorative styles and motifs, or paste categories, even if the number of producers is large. For this reason, in order to investigate the craft economy through the lens of fineware production and distribution, we must move “beyond iconography” (Vaughn and Neff 2000) and examine features that are not easily distinguishable, namely, mineralogical and geochemical composition. These attributes can be used to define groups of producers (Arnold 2000; Costin 1991:33), and, by extension, make conjectures about relative levels of control over the production and exchange of these ritually important objects. While it is possible that several producers drew from a single clay source, ethnoarchaeological work by Arnold (2000) suggests that potters generally exploit raw materials from limited ranges of 3-4 kilometers, and that visible variation in paste⁹ must be understood as variation in source material within a community’s resource area. Compositional analysis of ceramic artifacts is therefore a useful means for evaluating different models of production and distribution.

Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) was used for the geochemical characterization of selected fineware sherds. This analysis was carried out at the Elemental Analysis Facility at the Field Museum of Natural History in Chicago, IL, in March and April of 2010. ICP-MS is a method that is being increasingly used for the chemical characterization of archaeological ceramics. Such elemental data allows for the evaluation of variability present in source material present in a finished product. This technique has several advantages over other, perhaps more widely used, methods of analysis such as Instrumental Neutron Activation Analysis (INAA). Relative to INAA, ICP-MS has lower detection limits—

⁹ Variation in paste refers to variation in ceramic tempers/inclusions only and does not refer to variation in appearance due to firing.

on the parts per million level for most trace elements—and can characterize a wider range of elements. Together, these capabilities allow for the relatively rapid analysis of large numbers of samples, a distinct advantage over other techniques.

As summarized by Golitko (2010), ICP-MS functions by sending material into a super-heated gas (approximately 8000° C), which is known as a plasma. The plasma ionizes the sample, which is then sent into a mass-spectrometer, where the ions are sorted by their mass-charge ratio by a series of powerful magnets. Once separated, the ions can be measured by a detector array. ICP-MS can measure nearly all the elements between lithium and uranium on the periodic table, excluding a few elements including oxygen, nitrogen and all of the noble gasses (Taylor 2001:26).

Laser ablation is only one of the myriad ways that samples can be introduced into the ICP-MS torch (Golitko 2010). Samples are placed in a vacuum chamber and a pulsed laser beam ablates small amounts of materials from them. The ablated material is sent into the plasma using an inert carrier gas, such as argon or helium. The diameter of the laser is usually set between 55-220 microns, and ablation is typically carried out to a depth of 5-50 microns. An LCD camera attached to the laser allows for precise focusing onto specific areas of the sample. This method has several advantages for the analysis of ceramic artifacts, including minimal sample preparation, faster analyses, and the ability to pinpoint specific areas for analysis, while avoiding others (Speakman and Neff 2005). When coupled with laser ablation, where only the area ablated is subject to analysis—in this case, just the clay matrix—ICP-MS is able to avoid some of the problematic biases of aliquot-based techniques, including INAA, which assume homogeneity of a sample.

As the northern Titicaca area is geologically diverse (see Chávez V. and Gutierrez S. 1996; de la Cruz B. 1999; Ellison and de la Cruz B. 1987; Klinck and Palacios M. 1984), it was expected that clay sources in different river systems would yield distinct chemical signatures in the excavated ceramic artifacts. A core sample of fineware was selected from analysis with LA-ICP-MS from the materials excavated from Area A at Taraco during the 2006 and 2007 excavation field seasons. These results were compared with analogous materials from contemporaneous sites in the region in order to monitor the production and circulation of these goods over time on a regional scale. The details of these samples will be discussed further in Chapter 8. Although no systematic clay sourcing work has been conducted in the northern Basin, the goal of this analysis was to define chemical groups and evaluate variability in source material for the finished products. By charting the distribution of chemical groups across time and space, we may learn much about the relative numbers of producers involved in the manufacture of these high-status objects, as well as the nature of exchange relationships among neighboring sites (Vaughn 2000; Vaughn et al. 2006; Vaughn and Neff 2000). The identification of the actual clay sources used to make *incensarios*, *tazones*, and trumpets will be the focus of future research.

5.4.3.2 Obsidian

Obsidian does not occur naturally in the circum-Titicaca area, and its presence in the basin serves as a proxy for long-distance exchange (Burger, et al. 2000). Access to and/or control over the influx of obsidian from the Colca Valley would represent an important source of power. Rarely does end-stage production of obsidian tools take place at the same place as the source (Jennings and Glascock 2002); obsidian is imported either in its raw state or in preformed blanks, and then

manufactured into tools. Evidence from the southern Titicaca area (Bandy 2001) indicates that intra-basin trade in obsidian may have been restricted to finished points, rather than the raw materials. By implication, this evidence also suggests that only a few special sites may have had primary access to the raw materials; these sites would have been involved in tool manufacture. A locus of tool production would exhibit greater ratios of debitage to finished points, as the final products would be redistributed to other sites. Analysis of obsidian artifacts from each of the defined occupational phases was completed in order to determine when (at which point in the sequence) the residents of Area A had the greatest access to this resource. The abundance of obsidian relative to other locally available materials was calculated in order to monitor changing preferences for raw materials, and the relative levels of reliance on imported goods.

A random sample of obsidian objects were selected for geochemical characterization using portable X-ray fluorescence spectrometry (PXRF; Craig, et al. 2007) in collaboration with Dr. Patrick Ryan Williams of the Field Museum in Chicago, Illinois. This analysis was carried out at the Museo Contisuyo in Moquegua, Peru during the 2008 laboratory season. The goal of this analysis was to trace these obsidian artifacts to known, previously characterized (Glascok, et al. 2007) obsidian sources from around the south central Andean area. PXRF was an ideal technology for the study of these obsidian artifacts, as it is an *in situ*, non-destructive method of geochemical analysis. This method bombards a sample with X-rays, which displace electrons from the inner orbitals of the constituent atoms, causing electrons from the outer orbits to “fall” back into the lower orbitals. When this happens, fluorescent X-rays (radiation) are emitted and their wavelengths are recorded. Because different elements emit fluorescent X-rays of different—and known—wavelengths, researchers can use the peaks of the resultant graph to identify component elements in the sample. Following analysis with PXRF, the chemical

signatures of the selected samples were compared with those of the known sources in order to identify any possible matches.

5.4.4 Radiocarbon Dates

Several samples of organic material from Area A were taken for the purpose of absolute dating.

Great care was taken in the collection of these samples so as to avoid any contamination.

Charcoal samples were removed from their context with a trowel that had been freshly washed with filtered water, and were never touched with bare hands. Upon removal, they were placed in a pouch of aluminum foil, which was then placed in its own plastic bag. The analysis of these radiocarbon samples was performed by Dr. R.E. Taylor at the AMS Facility at the University of California, Irvine. The results of this analysis and the calibrated dates are presented in Appendix C.

CHAPTER 6: EXCAVATIONS AT TARACO

6.1 Introduction

This chapter summarizes the results of excavations carried out at Area A, the principal mound of Taraco complex, during the 2006 and 2007 field seasons. The first section of the chapter details the stratigraphy, features, and architectural remains for each of the excavation areas. The second section of the chapter compares the results of the excavation areas and presents a general summary of the mound's occupation.

In 2004, Area A, an artificial terrace located just below the highest part of the modern town, had been the focus of research of Charles Stanish and Edmundo de la Vega. Among local *quechua* speakers, this area is referred to as Patamoya, which literally translates to “foot of the river.” As discussed in Chapter 5, Area A held much promise for archaeological investigation. First, erosion of the northern margin of the mound by the Rámis River had exposed good occupational stratigraphy in this part of the site. Second, Area A appeared to be a large platform associated with the architectural center of the entire Taraco site area, which Kidder believed was originally located under where the church in the main plaza stands today (Kidder 1943). Based

on information from excavations elsewhere in the Titicaca region, it was hypothesized that Area A would contain high status architecture that would have been adjacent to the ancient sunken court now obscured by the church. Third, during survey of the Taraco-Arapa region, the surface of Area A was found to be covered in substantial quantities of Formative ceramics, including both Qaluyu and Pukara diagnostic materials (Stanish and Umire 2004).

The results of the 2004 test excavations, summarized in Chapter 5, suggested that Area A would be an ideal location to test models for the development of aggregated political centers. Excavation teams led by Levine and Chávez returned to the site in 2006 to pursue this goal through intensive archaeological investigations. Over the next two years, research focused on understanding the position of Taraco in the history of the north Basin. Specifically, these investigations sought to test Taraco's hypothetical status as a regional center, as suggested by the survey data, and identify the factors that contributed to its development into a nexus of political and economic activity. The objectives of these excavations were twofold. First, investigations aimed to refine the occupational sequence of the mound, known as Area A, which had been first defined in 2004. This goal was accomplished during the 2006 field season through the excavation of Unit II and Trench 1. These units indicated an occupational sequence for Area A reaching nearly four meters in depth, and dating from the early part of the Middle Formative Period through the present day. The second goal of excavation was to efficiently sample Area A, obtaining a representative data set and dates for occupations. The cleaning of Profiles I and II during the 2007 field season provided large transects of the mound, yielding excellent spatial data for Area A, which allowed for a site-wide understanding of stratigraphy, past activity patterns, and taphonomic processes. The results of these excavations (see Figure 6.1 for the

location of excavation areas), including stratigraphy, features, and architectural remains, are described below.

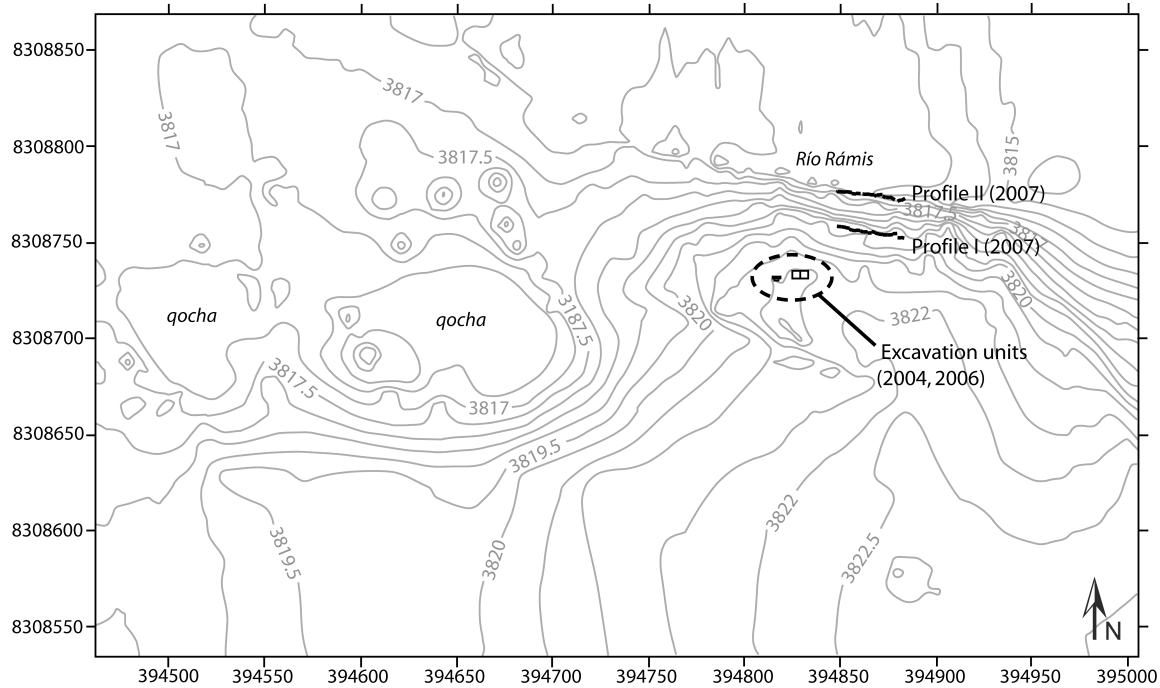


Figure 6.1. Area A (Patamoya) with excavation areas indicated

6.2 Unit II

Unit II was excavated primarily during the 2006 field season; some additional work was completed in Unit II-2 during the 2007 field season. Unit II measured 4 x 4 meters with its southwest corner located at N100 and E96 on the site grid (UTM N8308732 E394827 [WGS 84, 19L]). This excavation block was located 30 meters from the edge of the Rámis River and was situated adjacent to the unit excavated by Stanish (Unit I) in 2004. During excavation, Unit II was internally divided into four contiguous subunits each measuring 2 x 2 meters, which were numbered 1-4 (Figure 6.2). Datum 1, located at N110 and E100 on the site grid (UTM N8308742 E394831 [WGS 84, 19L]) and at an altitude of 3822.325 m.a.s.l., was used to measure

all elevations during excavation. For methodological and safety purposes, the excavation surface of the unit was progressively reduced as greater depths were reached. Excavation of Unit II finished almost four meters below the ground surface with a 2 x 2 meter area of excavation in Unit II-3, which served to define the earliest cultural levels. This work confirmed and refined the finds of the 2004 field season, exposing a sequence of 26 strata that corresponded with eight occupational phases (Figure 6.3), which are described below.

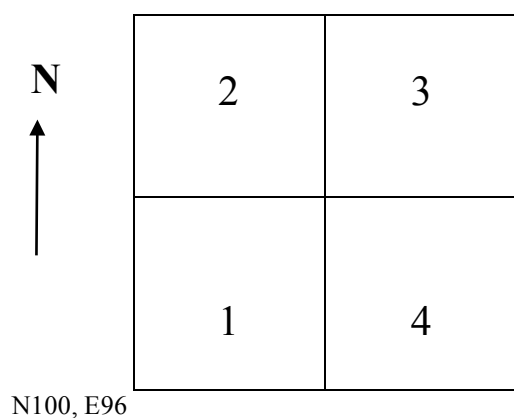


Figure 6.2. Diagram of Unit II showing interior subunits

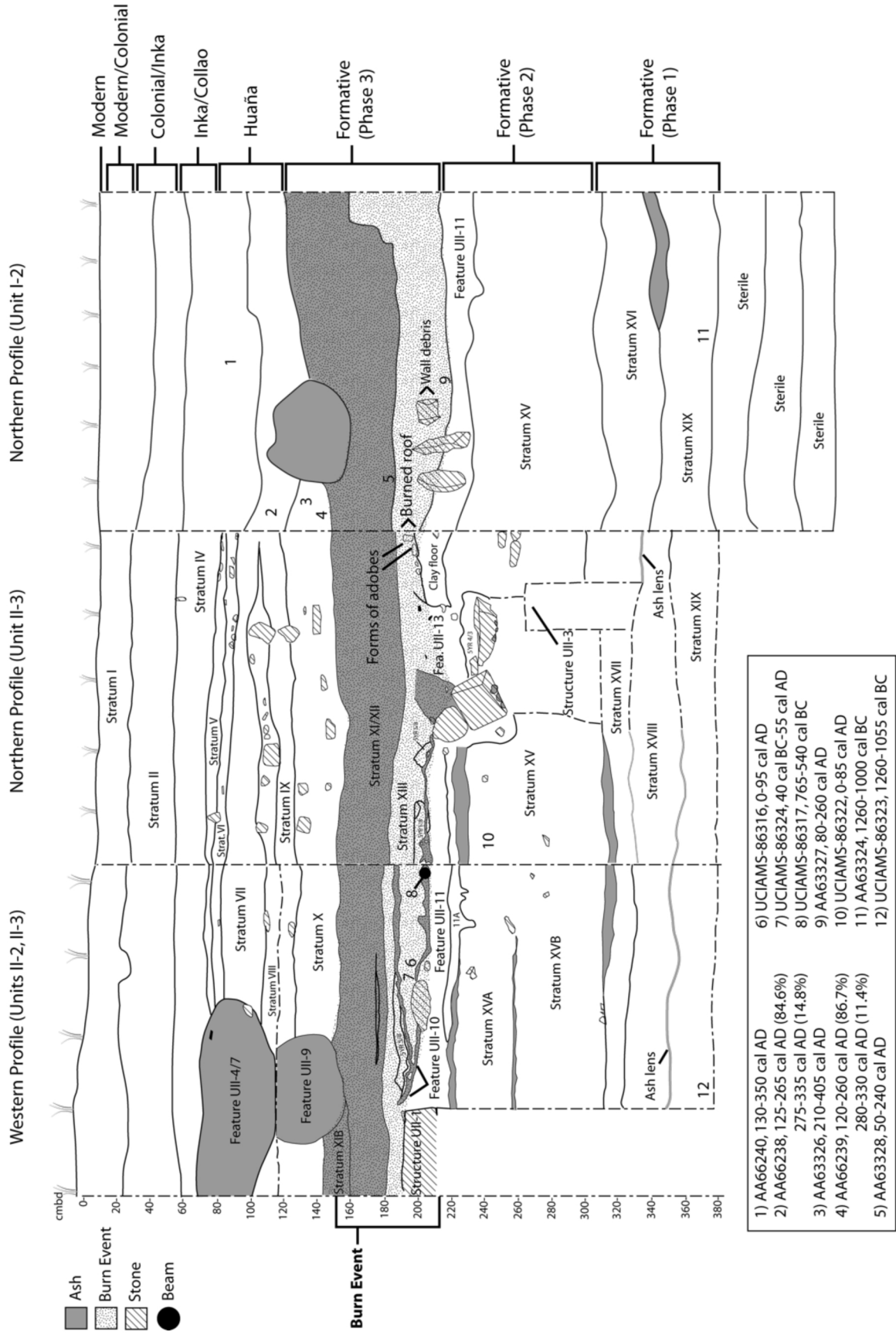


Figure 6.3. Excavation profile of Unit I and II with occupations and ¹⁴C dates indicated. Unit I was excavated by Stanish in 2004.

Occupational phase 1: Modern surface

Surface: The surface of Area A is currently used for cultivation purposes.

Occupational phase 2: Modern/Colonial fill

Stratum UII-I: This level corresponds with modern plow zone. The thickness of this level varied between 20 and 25 cm; this figure was found to be fairly consistent across the entire excavation area. The soil was brown (7.5YR 5/2 - 5/3) and loosely compacted. The soil was generally silty with less than 30% sand and some clay, with inclusions of angular gravel and organic materials, such as roots. This deposit was a mixed context containing a high density of cultural materials, including ceramics from all occupational phases, ranging from the Formative through the present day, in addition to modern trash, such as fragments of plastic bags and bottlecaps. This layer was excavated in two arbitrary levels (1 and 2).

Occupational phase 3: Colonial/Late Horizon fill

Occupational Phase 3, underlying the plow zone, contained two stratigraphic layers: Strata UII-II and UII-III. The nature of the cultural materials found in these strata suggested that they were not primary depositional contexts, but rather fill layers that were likely used for agriculture during the Late Horizon and Colonial Period.

Stratum UII-II: At the base of the plow zone a distinct stratigraphic change was encountered, with the soil becoming darker and more compact. Although the composition and natural inclusions of this stratum were similar to the plow zone, this context was easily distinguished by the significant change in color (10YR 4/2 - 4/3) and texture (semicompact), as well as a light dispersion of charcoal. This context contained a moderate amount of ceramics from various periods, as well as obsidian flakes and lithic hoes. A metal crucifix, likely dating to the Colonial period, was also found in this level. From the position of the cultural materials, it was inferred that this stratum was not a primary depositional context, but rather a fill level that was likely used for agriculture during the Late Horizon and Colonial Periods. Stratum UII-II was excavated in three arbitrary levels (3, 4, and 5) up to a depth of 62 cm below datum.

Stratum UII-III: This deposit was only found in the northern side of Unit II-3, and appears to have been an intrusive pit feature in Stratum UII-II. It was easily distinguished from the surrounding matrix due to its lighter, grayish brown color (10YR 5/2), as well as its compaction, which was looser in comparison. The soil of this context was a mix of silt, sand, clay, and ash. Notably, this feature contained a high density of lithic materials, though very few ceramics. This stratum was excavated separately from Stratum UII-II in two arbitrary levels.

Occupational Phase 4: Inka/Altiplano (Collao)

Stratum UII-IV: This stratum, excavated in two arbitrary levels (6 and 7) is a fill episode dating to the Late Horizon, and again, was likely used for agricultural purposes. The matrix was a semicompact mix of silt, clay, and sand with 10-15% coarse inclusions. This layer represents a

distinct stratigraphic change from Stratum UII-II, as the soil became darker (7.5YR 4/2 - 10YR 4/2), and the density of angular pebbles and cultural materials increased. Larger angular rocks, measuring 7-10 cm, were also present. This deposit contained a moderate concentration of Inka and Collao ceramics, as well as a variety of different types of lithics, including flakes, hoes, and what appear to be slingstones, which would have been used during warfare or hunting. Many different species of camelids, fish, and birds were represented among the faunal remains recovered from this context.

Feature UII-2: Stratum UII-IV was found to be associated with two concentrations of large irregular stone blocks, which were designated Feature UII-2 and UII-3. Feature UII-2 was located in subunit II-3 at a depth of 60.2 cm below Datum 1. It was excavated in three arbitrary levels corresponding with the elevations of the levels excavated in the remainder of Unit II-3. This feature was composed of a group of large angular stones oriented along a north-south axis, with total dimensions measuring 110 cm (N-S) x 80 cm (E-W). These stones were arranged in two levels. The upper level of stones was arranged in a circle, with the individual blocks oriented towards the center of the circle. These stones were associated with the cranium of a feline, and the surrounding soil contained burned clay and bones, as well as a moderate quantity of Collao ceramics. The lower level of stones was arranged more closely together, and was associated with more burned bone as well as an increased amount of burned earth.

Feature UII-3 was a similar group of angular stones located in subunit II-1, and located at 73 cm below Datum 1. This feature appeared to be a scaled-down version of Feature UII-2; total dimensions measured only 45 cm (N-S) x 55 cm (E-W), and the constituent stones were

significantly smaller. The soil surrounding these stones contained a high density of bones and ceramic materials.

Occupational Phase 5: Huaña

The Huaña occupation manifest in Unit II was composed of three depositional levels: two activity surfaces and one fill episode. The two activity surfaces, which stretched over the entire area of excavation, were superimposed and characterized by ephemeral tamped floors (as opposed to prepared clay surfaces). These floors were recognized by the presence of artifacts and small stones with horizontal orientations lying at the same elevation, in addition to the presence of thermal features. The fill event, the earliest phase in the Huaña occupation, was nearly a meter thick and was composed of five distinct strata. This episode was likely used to level an underlying uneven deposit. Evidence of an early Huaña (or immediately post-Formative) occupation, including remnants of a field-stone wall and two pit features, was identified during the 2007 excavation of the earliest of these strata (Stratum UII-X) in the subunit UII-2; no floors or living surface was found in association with these features, however.

Activity Surface 1:

Stratum UII-V: This extremely thin (2-3 cm in thickness) level is the latest of the Huaña occupational surfaces found in Unit II, and was excavated in a single arbitrary level. This level was found to contain a high density (20-30%) of cultural materials, such as fragments of ceramics and bones, as well as pebbles, and gravel. All of these materials were found oriented

along the same horizontal plane, and at the same elevation suggesting that they had been trampled into place over the course of daily activities. Such expedient living surfaces are consistent with floors found in other contemporaneous sites in the region, including the monumental center of Tiwanaku. These types of surfaces are markedly distinct from the prepared clay surfaces found in Formative levels of other Titicaca Basin centers, such as Chiripa and Kala Uyuni (Bandy 2001; Cohen and Roddick 2007). The soil of stratum UII-V clayey with both silt and sand components, and with 15% coarse inclusions. In addition to the high concentration of cultural materials, this occupational surface was associated with two thermal features, Features UII-4 and UII-5.

The first thermal feature, **Feature UII-4** was discovered at a depth of 86 cm below Datum 1, and measured 86 cm (N-S) by 20-30 cm (E-W). Consisting of an area of burned earth that was yellowish red (5YR 5/6), the feature contained increased amounts of fish bones relative to the surrounding matrix. Although originally interpreted as a hearth or food preparation feature associated with the Huaña occupation, analysis of a radiocarbon sample (TA-1628¹⁰), as well as constituent ceramics, indicate that Feature UII-4 was rather an intrusive pit feature from a later period. It is likely that Feature UII-4 was subterranean or semi-subterranean earth oven that was excavated down into the Huaña occupational levels.

In contrast, **Feature UII-5**, probably was associated with the Huaña period occupation. Located at 85 cm below Datum 1, Feature UII-5 measured 45 cm (N-S) by 84 cm (E-W). This feature is interpreted as a hearth; however, it may have also been a pit used to bury the refuse from a hearth. While generally similar to Feature UII-4, Feature UII-5 contained greater quantities of ash, but fewer pieces of burned earth. This ashy matrix contained flecks of carbon as well as fish bones.

¹⁰ UCIAMS-37489 (TA-1628), AD 1650-1950. Calibrated at 2-sigma using Calib 5.0.2.

Activity Surface 2:

Stratum UII-VI: Located immediately underneath Stratum UII-V, this level is another occupational surface dating to the Huaña period. Stratum UII-VI was excavated in a single arbitrary level. The matrix was compact and clayey, with both silt and sand components. There was no evidence of any attempt to prepare this area as any sort of living surface; similar to the previous level, Stratum UII-VI contained 20-30% angular gravel and ceramic fragments, and 10-15% coarse inclusions, as well as a dispersion of stones measuring 7-10 cm in length. Within this matrix was discovered a large quantity of cultural materials, including Formative and Huaña ceramics, groundstone hoe fragments of andesite or basalt, and a substantial amount of faunal remains, which included both camelid and fish bones. All of the materials contained in this level—both natural and cultural—were oriented along the same horizontal plane and were situated at the same elevation, indicating that this level was indeed a distinct occupational surface that, as with the surface immediately above, had been trampled flat by its users.

This surface was marked by a thermal feature, **Feature UII-6**, which was very similar to Feature UII-4 both in form and in color. This feature, easily distinguished by its bright yellowish red color, measured 30 cm (N-S) by 54 cm (E-W), and was excavated to a depth of 10 cm. Excavation of this feature found a matrix of burned clods of earth and clay, which contained moderate quantities of faunal remains (mostly camelid, but some bird as well). This feature was likely an earth oven associated with this Huaña period occupational surface.

Fill:

The earliest component of the Huaña occupation consisted of nearly a meter of fill. This major fill event was identified across Area A in all areas of excavation (see description of Profile I from the 2007 excavation season), and in Unit II, this episode was composed of five distinct strata. Remains of domestic features within fill levels indicate that it probably took some time to level the mound. Analysis of the ceramics from these levels, coupled with the analysis of radiocarbon from the contemporaneous levels of Unit I, nevertheless suggest a relatively restricted time frame for the deposition of the fill within the early phases of the Huaña occupation.

Stratum UII-VII: Following the excavation of Stratum VI, a compact occupational surface, a distinct change in soil composition was noted. The soil immediately underlying this surface, labeled Stratum VII, contained far fewer cultural materials, and lacked the abundant quantities of angular gravel and stones characteristic of the previous level. The matrix of this level was a semicompact silty clay loam that was brown (10YR 4/3) in color. The layer of fill contained <10% angular gravel and relatively few cultural materials, such as ceramics, lithics—including some obsidian—as well as some faunal remains. Notably, the artifacts that were present in the greatest quantities—ceramics and andesite hoes—suggest an occupation of an agricultural character. Stratum VII was excavated in two arbitrary levels (10 and 11), and was associated with an ash pit (**Feature UII-7**), located at 111 cm below Datum. This shallow pit feature, located along the western profile of Unit II-2, measured 96 cm (N-S) by 30 cm (E-W). The fill from the interior of the pit was very soft, and contained large quantities of ash mixed in with the

soil. Very few cultural materials were associated with this feature. Feature UII-7 was excavated to a depth of 119 cm below Datum 1.

Stratum UII-VIII: This level is a distinct, semicompact fill layer characterized by the presence of many cobbles and stones, as well as a large quantity of angular gravel. The soil of this level had both silt and clay components, and contained some carbon inclusions, which appeared as black flecks within the general brown (7.5YR 4/3) matrix. Feature UII-8, a subcircular pit feature, was identified on the surface of Stratum VIII on the border between Unit II-1 and II-2 at a depth of 111-114 cm below Datum. Excavation of this feature began during the 2006 field season, but was completed during the 2007 field season. Measuring 68 cm (N-S) by 50 cm (E-W) by 45 cm (depth), the surface of the pit consisted of compact sand that was slightly lighter in color than the surrounding matrix. Underlying this sandy cap was a very loosely compacted soil. Excavation of this loose soil exposed two angular stones measuring 15 and 12 cm at depths of 120.5 cm and 127 cm, respectively. Further removal of this loose soil indicated that the pit was not actually round, but rather undercut the excavation surface. The majority of the matrix found in the interior of the pit was composed of broken ceramics (averaging 4-7 cm in size), angular gravel, as well as occasional cobbles averaging 10 cm in size. Several faunal remains, including a poorly preserved mandible of a small camelid were discovered in the area of the pit that extended into the western profile of Unit II. Further excavation revealed a very large stone that almost completely filled the width of the pit. This stone was carefully cleaned and photographed prior to removal. Beneath the rock was a jumbled mix of sandy soil, bone, ceramic, and stone. This fill continued until the base of the pit was reached at 165 cm below Datum 1. While the

exact function of Feature UII-8 remains undetermined, it was likely used for the disposal of trash and other domestic refuse.

Lot UII-2/3: During the excavation of Stratum VIII, the stony fill layer, one area with a particularly high concentration of materials was identified. This area, distinguished by greater quantities (as much as 50% in some areas) of angular gravel (measuring 2-4 cm), ceramic, and bone, was excavated separately from Stratum VIII, despite sharing many other general characteristics.

Stratum UII-IX: This level was discovered immediately underneath the stony soil of Stratum VIII and Lot 2/3. In Units II-3 and II-4, Stratum IX was excavated during the 2006 field season in two arbitrary levels (13 and 14). In Unit II-2, Stratum IX was excavated in a single level (14) during the 2007 field season. This loosely compacted, light brown (7.5YR 4/3-10YR 4/3) soil had both silt and sand components, and this matrix contained moderate densities of carbon and reddish (likely burned) clay inclusions, and ash was found dispersed throughout. The matrix also contained a number of large (10-20 cm) cobbles, as well as pebbles measuring 5 cm, however these inclusions were not present in the quantities found in the prior levels. Excavation also yielded a significant amount of cultural materials, including Formative ceramics, faunal remains, basalt hoes, and obsidian. Stratum IX was associated with a pit feature, Feature UII-9.

Feature UII-9 was located at N102.40/102.90 E97.78/98.20 on the site grid, and was identified at 120-122 cm below Datum 1. This feature was bisected and was excavated in 4 arbitrary levels, although no internal stratigraphy was evident. In the first two levels the fill of this pit feature

was very soft and fine, consisting of almost pure ash with some flecks of carbon, and burned clay inclusions. This matrix contained a low density of various types of faunal remains, including burned camelid bone, fish scales, and bird bones. More materials were encountered during the excavation of the lower two levels—the base of the pit was associated with a number of stones, a handle of a ceramic vessel, and a metal artifact.

Stratum UII-X: Stratum X, another semicompact layer of fill, was distinguished from Stratum IX due to its absence of carbon and red clay inclusions, and is the earliest of the Huaña levels found in Unit II. This level was also sandier and was found to contain less silt than the previous one. The brown (10YR 5/3) matrix contained fine, rounded gravel and a few small stones, as well as moderate densities of Formative ceramics, faunal remains, a worked stone, as well as lithic debitage. In Units II-3 and II-4, Stratum X was excavated in two arbitrary levels (15 and 16) during the 2006 field season. In Unit II-2, Stratum X was excavated in a single arbitrary level (15) during the 2007 field season.

Following the completion of the 2006 field season, it was believed that Stratum X, as represented in Unit II, was simply a level of fill, as it was not found to contain any evidence of occupation. Upon returning to Unit II-2 in 2007, however, the excavation crew discovered the poorly preserved remains of a domestic habitation. These remains—a pit feature, a camelid burial, and a portion of a wall—were associated with the surface of the level (identified following the removal of soil from Stratum IX), and are indicative of an early Huaña, or simply post-Formative, occupation. The wall associated with Stratum X, termed **Wall UII-4**, was oriented southwest to northeast, and had been constructed from irregularly shaped blocks of

varying sizes. It was situated at an elevation 136-145 cm below Datum 1, and measured 35 cm at its widest point. Much of the wall appeared to have been destroyed.

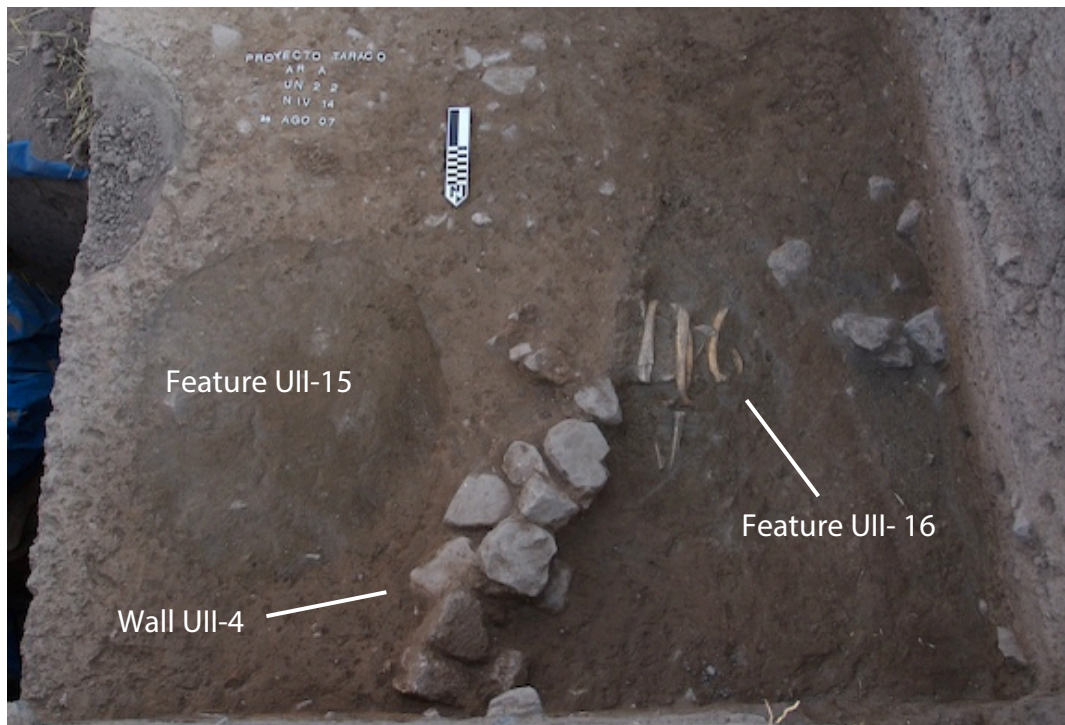


Figure 6.4. Surface of Stratum UII-X with features indicated.

As mentioned above, Wall UII-4 was associated with two features suggestive of a domestic occupation: an ash pit (**Feature UII-15**) and a camelid burial (**Feature UII-16**). Feature UII-15 was a shallow, circular pit located on the eastern side of Wall UII-4 (at 103.02/103.72; E: 97.18/97.88 on the site grid) at a depth of 149 cm below Datum 1. The fill of the pit consisted of a soft, fine, ashy soil that was brown in color (7.5YR 4/3). The pit, reaching only 10 cm in depth, contained very little in the way of cultural materials. Feature UII-16 was located at N: 102.80/103.70; E: 96/96.80 on the site grid at a depth of 151 cm below Datum 1. This feature was a **U**-shaped pit that abutted Wall UII-4 on its western side, with the opening of the **U** facing towards the north. Reaching only 6 cm in depth, this shallow pit contained the

remains of a juvenile camelid and another very small—perhaps fetal—animal. These faunal remains were associated with pieces of what appeared to be blue eggshell. Unfortunately, the architectural remains were quite isolated and no indication of an occupational or floor surface was evident during the course of excavation of Stratum X, or noted in the profiles, for that matter.

Occupational Phases 6-8: Formative

Based upon associated ceramics and radiocarbon dates, the earliest three occupations defined during the excavation of Unit II (Occupational Phases 6, 7, and 8) date to the Formative Period. These three phases were originally termed Formative Phase 1, 2, and 3, as to avoid any potential biases associated with assigning them to any exact point in the Formative chronology (e.g., Middle Formative, etc.). These occupations were each associated with a building made of fine stone, with the later two buildings superimposed over the earlier constructions. Floors were composed of fine, prepared clay that was often reddish in color. These were interspersed with lenses of ash, indicating that they were periodically burned and re-laid. These Formative occupational phases, while clearly domestic in character, were also associated with significant quantities of exotic materials, such as obsidian, and prestigious crafted goods, including elaborately decorated ceramic trumpets and *incensarios*. Excavation of the Phase 3 occupation also yielded a continuation of the major burn event first identified during Stanish's 2004 field season, which had been dated to AD 50-240.

Formative Phase 3

The third and final phase of the Formative occupation corresponds with early Pukara, and dates to the first century AD. In Unit II, this phase was associated with two depositional levels—a high-status, domestic occupation, followed by a major burn event, which consisted of a number of unique and complex strata. The details of these data are described below.

Burn event:

Stratum UII-XI: This layer of dark yellowish brown soil (10YR 4/4) constituted part of the major burn event, and capped the Formative occupation found in Unit II. This layer was very distinctive due to its color and texture. The sandy matrix was very soft and contained a significant amount of ash, which gave it a somewhat greasy texture. Notably, this was the first level found to contain Pukara Polychrome pottery—several examples of finely incised and painted sherds in this style, including one *incensario* fragment modeled to represent a mouth with square teeth (TA-1815), were unearthed during excavation (Figure 6.5). A Type 5C (M. Aldenderfer, personal communication, 2007) obsidian projectile point (TA-5526) was also found in Unit II-2. Stratum XI was excavated in a single arbitrary level (17) during the 2006 field season in Units II-3 and II-4, and in Unit II-2 (16) during the 2007 field season.



Figure 6.5. TA-1815. Pukara style zone-incised polychrome *incensario* sherd.

Stratum III-XII: This layer consisted of a fine soil matrix containing significant amounts of ash, flecks of carbon, and red, burned clay inclusions. As a result of its heterogeneous composition, Stratum XII had a multi-colored appearance, with both dark brown (10YR 4/4), red (5YR 5/6), and yellow (10YR 4/4) components. The soil was semicompact and contained a light concentration of gravel as well as several charred fragments of bone and ceramic, fish scales, obsidian, and other types of lithic artifacts. This stratum was excavated in two arbitrary levels in Units II-3 and II-4 (18 and 19), but as a single arbitrary level in Unit II-2 (17).

After completing the excavation of Unit II it was noted that in some areas of the profiles, Stratum XI and Stratum XII joined to form a single layer of ashy soil, labeled on the drawings as Stratum XI/XII. For the most part in Unit II, these two strata were easily distinguishable due to their general color and composition; however in some areas they mix—exhibiting characteristics of both strata—and it became impossible to separate them. As such, these ashy layers are indicative of the complex, and sometimes chaotic, stratigraphy that is often associated with destructive events.

Stratum UII-XIII: Immediately underneath the ash layer Stratum XII was discovered a dark reddish brown (7.5YR 4/3) layer of compact, clayey soil containing a mixture of ash, flecks of carbon, and prepared, red clay. Small stones and angular gravel, as well as cobbles measuring 7-10 cm, were also noted dispersed throughout the matrix. Relative to the previously excavated levels, Stratum XIII contained lower concentrations of cultural materials, which included fragments of Pukara style pottery, lithic artifacts, burned bone, and fish scales. Stratum XIII was excavated in three arbitrary levels (20, 21, and 22) in Unit II-3, two arbitrary levels in (20 and 21) in Unit II-4, and as Lot 8 (part of Level 18) in Unit II-2.

Domestic occupation:

Removal of the soil of Stratum XIII exposed the architectural remains of an extensive early Pukara occupation. A structure, termed **Structure UII-1** was identified at an elevation of 190-200 cm below Datum 1. Structure UII-1 was composed of two double course stone foundations measuring approximately 40 cm in width and 20 cm in height. These walls were made out of finely cut stone blocks of variable size that had been joined together with a prepared reddish clay. The first of the two walls (Wall A) was found on the border between Units II-3 and II-4, and was oriented southeast-northwest, sloping downward slightly on the western side. A sherd of red Pukara pottery was found between wall stones, suggesting an Upper Formative temporal affiliation for the structure. The second wall (Wall B) was unearthed during the 2007 excavation season in Unit II-2, and, running southwest to northeast, formed a corner with Wall A. It is likely that these stone walls would have served as the foundation for an adobe superstructure, as is customary for architecture even in the modern-day *altiplano*. This may help to explain the

presence of large chunks of fairly homogenous clay mixed in with the ash-filled matrix of Stratum XIII—these were probably the degraded remains of the adobe superstructure that had been destroyed by the burning event. Structure UII-1 had a number of associations, including interior and exterior activity surfaces, a roof and roof beams, and a large trash pit (Figure 6.6).

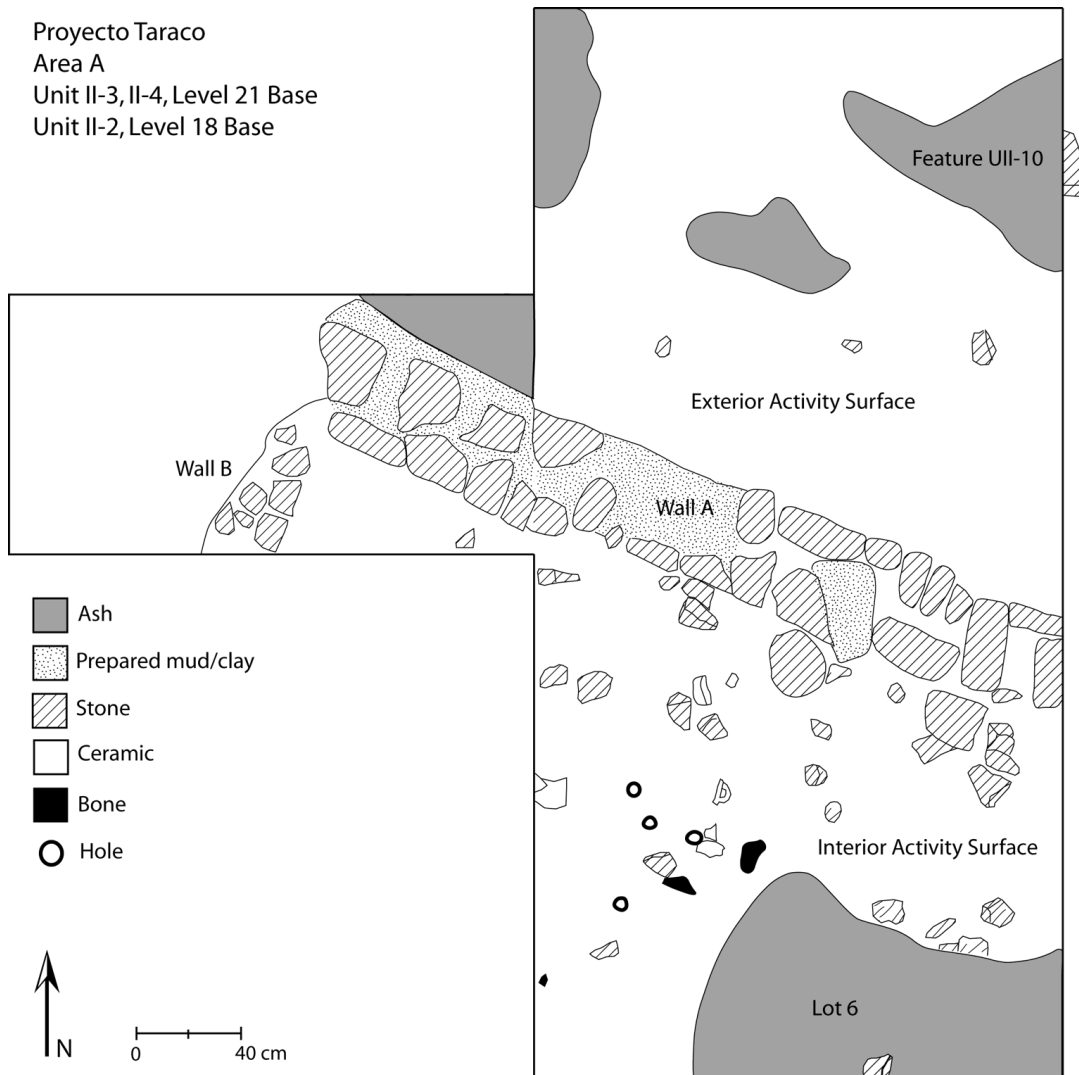


Figure 6.6. Plan of Structure UII-1 showing interior and exterior activity surfaces

Interior activity surface: In Unit II-4, the removal of Stratum XIII revealed an interior activity surface immediately to the south of Wall A. This surface, likely part of an enclosed patio, was not particularly well made, and the matrix did not appear to have been prepared in any way. It

was also marked by a series of holes, which were each assigned a letter designation (A-G). The holes were originally believed to have been postholes; however, their irregular placement does not suggest that they would have housed any architectural elements. Each of the holes reached approximately 20 cm in depth, and while most were empty, three of them (B, D, and G) contained ceramic sherds. The sherd contained in hole D had two holes drilled through it. A concentration of ash (Lot 6), containing significant amounts of burned clay, prepared clay, and burned bone, was also found just to the southeast of these holes.

Klarich (2006), discussing pottery production among contemporary artisans in the *altiplano*, may offer a possible explanation for these archaeological finds. She cites a conversation held with her informant, a potter, during her 2001 excavations of the central pampa at the site of Pukara. Her informant points out that a recently excavated surface is reminiscent of the patio of his own house, where, incidentally, he would make most of his pottery:

Informant: Pues, hay piso pero no bien hecho, hay huecos llenos de materiales de producción como temperantes, hay herramientas para pulir y moler, y esa mancha de arcilla amarilla no es parte del piso preparado, parece una zona donde se cayó en el suelo la pintura/engobe y se secó, no? (Klarich and Ttacca 2006).

Informant: Well, there is a floor, but not well made, there are holes full of materials like temper, there are tools for polishing and grinding, and this patch of yellow clay isn't part of a prepared floor, it looks like paint or slip spilled on the patio and dried. You see?
[translation by Klarich]

While no direct evidence for pottery production was found in Unit II, the surface identified in Unit II-4 nevertheless shares certain characteristics with the informant's patio. It is likely that the sherds found in the holes may have served as tools or tokens, and if they were not used for pottery manufacture, such as those used by Klarich's informant, then perhaps they served for some other craft activity. Substantiating this idea, the sampling of Lot 6 yielded the refuse of both domestic and productive activities. In addition to the burned camelid and bird bones, which

are often found in domestic trash pits, a number of tools, including an andesite discoid and seven fragments of worked bone (likely associated with weaving activity), were also recovered (Figure 6.7). It is likely that this surface may have been a locus of some type of household-level craft production, and such a scenario is consistent with other Formative occupations found around the Titicaca Basin and the Andean area (see discussion in Roddick 2009).



Figure 6.7. Tools discovered in Lot 6. Andesite discoid (left) and worked bone fragments (right).

Feature UII-10: The second feature associated with Structure UII-1, Feature UII-10, was a roof and roof beams, which had all been burned. Feature UII-10 was identified to the north of Wall A in Unit II-3, and was located at N102.80/104 E98/100 on the site grid at an elevation of 200 cm below Datum 1. The roof had been made of *ichu* grass that had been bundled and layered to form thatch. These bundles of grass are often referred to locally as *paja*. The *paja* had been lashed to wooden posts using leather straps, an example of which was also found during excavation. The hairs on these straps suggest that they were camelid in origin.

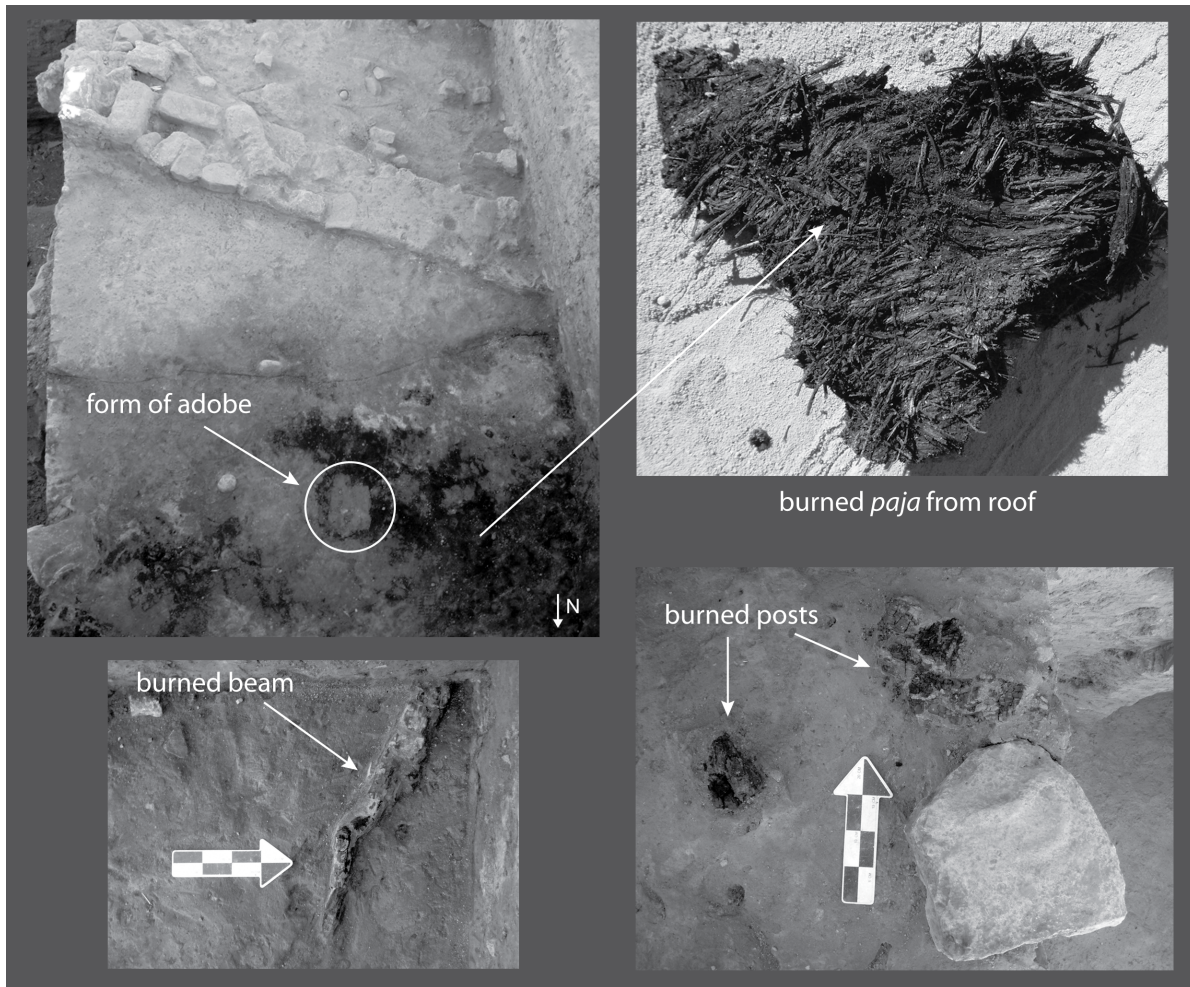


Figure 6.8. Feature U11-10. Excavation of this feature yielded burned *paja* and roof beams, and revealed a broken monolith carved with a Qaluyu-style snake (lower right).

Within the carbonized thatch excavation crews uncovered several subrectangular areas of prepared clay; these were interpreted as forms of degraded adobes that had originally been part of the superstructure of Structure U11-1. An area of whitish soil was identified on the western side of the feature, and was also visible in the profile. Upon close examination, this whitish “soil” was actually formed by tiny fibers. Local informants identified this material as *paja* that had been burned for high temperatures for extended periods of time. Two radiocarbon assays (T-1894 and TA-1895) indicate the roof had been burned in the first century AD (see Appendix C).

Exterior activity surface (Feature UII-11): The removal of the roof (Feature UII-10) revealed a nearly pristine, prepared red clay floor surface, which we labeled Feature UII-11. This floor was designated as an exterior activity surface because it was situated on outside of Structure UII-1. Feature UII-11 was excavated in three arbitrary levels (23, 24, and 25) until an ash lens (Lot 7), signifying a transition between floor levels, was encountered. The compact matrix of the floor was composed of reddish-brown (5YR 5/4) fine, clayey soil that was slightly sandy. Wet screening of 5 liters of soil indicated that this matrix contained very little in the way of natural or cultural inclusions, apart from some fine and medium-sized gravel, a scattering of broken ceramics, fish scales, and burned bone. Notably, of the 37 diagnostic ceramic sherds that were recovered from this floor, nearly half (49%) of them were decorated in some way, and of these decorated sherds, several were non-domestic finewares (i.e., *incensarios*). The results of the ceramic analysis will be discussed in detail in Chapter 7.

Because Structure UII-1 was likely destroyed abruptly in a major burning event, several artifacts were preserved *in situ* on the surface of Feature UII-11, and suggest that the compound's residents were of relatively high status. A fragment of a monolith carved with a serpent was discovered on the floor surface adjacent to one of charred posts from the roof (Figure 6.8). The shape of the piece indicates that it had probably been broken off the top of a much larger stone. The snake, is part of the suite of icons commonly associated with Yaya-Mana lithic art, and is often attributed to Middle Formative, or Qaluyu, occupations. Data from around the Titicaca area indicate that monoliths tend to be associated with the ritual and/or political center of Formative period settlements. The presence of this piece of lithic art likely is therefore highly significant.



Figure 6.9. TA-1907

A fragment of a Pukara incised polychrome bowl (TA-1907) decorated with a feline motif was also discovered smashed on the floor surface at 214 cm below Datum 1 (Figure 6.9). This is a motif echoed in the lithic art found both at Area A as well as around the Taraco site area. Importantly, the matrix of the floor contained Qaluyu wide-line incised and painted ceramics in a frequency inconsistent with curation—although it is possible that the floor was prepared using soil that contained sherds from earlier periods, as mentioned above, this floor contained very few cultural materials. The floor had clearly been carefully prepared, and the inclusion of these diagnostics was likely due to their use by residents, rather than by accident. The co-occurrence of Qaluyu and Pukara-style decorated pottery indicates their simultaneous use by residents of Area A, and even possibly, their manufacture. This find is doubly important because, not only are these both high-status craft goods decorated with ideologically significant motifs, but also traditional chronology in the northern Lake Titicaca Basin assumes that these two styles represent sequential cultural phenomena. Alternatively, it may also suggest interaction

and exchange with the site of Pukara, which had already begun producing its distinctive polychrome ceramics by this time.

The excavation of this floor also yielded **Feature UII-13**, an accumulation of faunal remains, at an elevation of 214-218 cm below Datum 1. These remains did not form a complete skeleton; for that matter, they were not even all from the same species of animal, let alone the same individual. A preliminary sort of the remains identified remnants of camelids, birds, and fish, and the vast majority of these bones were cut or broken. Importantly, the profile of Unit II-3 clearly shows how a portion of the floor had been excavated and then re-filled. Although faunal analysis remains to be completed, these intrusive bones have been interpreted as the remains of a family meal, which had been interred in the floor in lieu of disposal in a receptacle or trash pit. Because of the high concentration of small bones, all of the soil from Feature UII-13 was collected for wet screening and flotation.

Feature UII-12: The final feature identified in association with Structure UII-1 was a deep, circular trash pit located at N102/102.80 E98.80/99.74 on the site grid. Termed Feature UII-12, this pit was discovered on the surface of the prepared red clay floor (Feature UII-11) at 218 cm below Datum 1, and was hourglass-shaped in cross section, reaching 120 cm in depth. It contained included a mix of ash, bit of burned red clay, earth, and small stones, as well as coprolites. Within this matrix was found a significant amount of domestic refuse, such as charred ceramic sherds—including some fragments of Pukara polychrome incised pottery—and burned faunal remains, including a complete scapula, which was revealed at 295 cm below Datum 1. A number of angular stones, measuring 10-20 cm, rested at the base of the pit.

Importantly, the construction of this pit destroyed part of the underlying habitations, cutting into both Wall UII-3 and Feature UII-14.

Lot UII-7: This lens of yellow (2.5Y 4/4) ash was discovered at the base of Feature UII-11, and separated it from the underlying Phase 2 Formative occupation (Stratum XV). The soil of Lot 7 was fine and semicompact due to a significant ash component, and it was found to contain fragments of bone, ceramic, and lithic artifacts, as well as some pieces of burned bone.

Formative Phase 2:

The second phase of the Formative occupation represented in Unit II was composed of two depositional levels (Stratum XVA and XVB) that were associated with a building made of fine stone. This building, Structure UII-2, had been partially uncovered by Stanish and de la Vega during their 2004 field season. Based on stratigraphy, associated finds, and radiocarbon, Phase 2 likely dates from the Middle Formative to the early Upper Formative Period.

Strata UII-XVA and UII-XVB: These two depositional layers, separated by a thin lens of ash, represent the domestic occupation associated with the second phase of Taraco's Formative settlement. Stratum XVA was excavated in four arbitrary levels (levels 26-29), as was Stratum XVB (levels 30-33A). Identical in their composition, these strata were much darker and far less red than the prepared floor (Feature UII-11) associated with the Phase 3 occupation. It should be noted that these strata likely represent the accumulation and/or remodeling of floor surfaces; given their thickness, it is unlikely that they were each deposited in a single event. The matrix of

these layers was composed of dark brown (7.5YR 3/3) soil that was fine and compact, with significantly less clay than the Phase 3 floor. This matrix was fairly homogenous; apart from a dispersion of small whitish inclusions and angular stones measuring 5-7 cm, it contained little in the way of natural and/or cultural materials. For example, during the excavation of level 32, the screening of 20 10L buckets of soil yielded only a single ceramic sherd. However, among the few materials that were found during excavation were several high status prestige goods, including sherds with Qaluyu-style incision and painted designs, incised Pukara wares, obsidian flakes and debitage, and deer antler. Perhaps the most significant of these finds was a polychrome incised ceramic feline face (TA-1986), which was found in level 29 during the excavation of Stratum XVA. Although it was poorly made, it was nevertheless very similar to those used to adorn the *incensarios* and annular base bowls found at the site of Pukara. Again, the full details of the ceramic analysis will be presented in Chapter 7.

The excavation of Stratum XVA revealed two architectural features. The first was **Structure UII-2**, which was first identified during the 2004 field season. Although the stones of this wall had already been exposed, the removal of soil from levels 26 and 27 completely cleaned the western side of the stones; no new (i.e. previously unexposed) wall stones were identified during the excavation of this level. The second feature, **Feature UII-14**, was a subcircular stone cist located at N102.59/103.53 E98.42/99.30 on the site grid, and measuring 94 (N-S) x 88 (E-W) cm along its exterior. First identified at 245 cm below Datum 1, this feature was a circular sub- or semi-subterranean, stone-lined pit consisting of two chambers, which were stacked one of top of the other. A stone slab, now broken by years of pressure brought by the overlaying 2 m of soil, served as a lid for the upper chamber. Red (5YR 4/3) clay had been used to join the uppermost stones of the feature, which would have been exposed while it was in use. Removal of

the slab exposed more of the same reddish clay, as well as a significant amount of burned materials. The interior of the upper chamber basically empty, containing only a dark, loosely compacted sandy soil. Analysis of radiocarbon from this fill (TA-1983) yielded the calibrated age 0-85 cal AD (2-sigma). At the base of the upper chamber were a flat stone and more clay, signifying the bottom of the chamber. While architectural similarities with features found elsewhere in the Titicaca area suggest that this feature may have served for storage purposes, as the feature contained very little cultural materials, no evidence was discovered that could support or refute this hypothesis.



Figure 6.10. Feature UII-14 before (left) and after (right) removal of the slab.

Continued excavation of the soil around the perimeter of the feature indicated that this stone was not actually the bottom of the cist, but rather a cap for a second, lower chamber. Such a seemingly false floor may signify that an earlier iteration of the feature was remodeled or enhanced as more floor levels accumulated around it (so that it could stay sub- or semi-subterranean) so that it could be continued to be used. This idea is substantiated by the fact that, without this “floor,” Feature UII-14 would have been extremely deep once the final phases of construction were completed. As excavation of Unit II progressed, it was discovered that the

lowest stones of the cist had actually been placed at an elevation of 337 cm below Datum 1, such that the entire feature, as it was encountered, measured nearly a meter in depth from top to bottom. If this cist had in fact been used for subterranean storage, such a depth may have posed an inconvenience for residents using the feature in its completed state. Filling in the earlier phase of the feature (the lower chamber) and creating a floor at 273 cm below Datum 1 would have enabled residents to continue using this storage feature despite any remodeling that might have taken place, as the depth of the upper chamber was shortened to a much more manageable 28 cm. When the Phase 2 occupation was leveled in preparation for the construction of Phase 3 architecture, Feature UII-14 was completely sealed with red clay, likely in an attempt to create a more stable foundation on which to construct subsequent buildings.

A wall from a third Formative architectural feature, **Wall UII-3**, was exposed during the excavation of Level 31 at an elevation of 273-283 cm below Datum 1. This wall was oriented north to south, and measured 92 cm in length. While Wall UII-3 was built of cut stone, it was composed of only a single course of blocks, and its overall construction was not as fine as that of Structures UII-1 and UII-2. While it was exposed in the lowest levels of Stratum XVB, analysis of associated stratigraphy suggests that this wall was likely used during the final phase of the Formative Phase 1 occupation.

Formative Phase 1:

The earliest phase of the Formative occupation represented in Unit II was composed of three depositional levels, which were each separated from one another by a very thin layer of ash and carbonized material. These likely each represent the accumulation of floors or use surfaces,

which were periodically burned and re-laid, and possibly correspond with distinct occupations. The latest of these depositional levels, consisting of Stratum XVI and Stratum XVII, was associated with the use of Wall UII-3. Unfortunately, during the excavation of Formative Phase 1, a miscommunication with the excavators resulted in the mixing of arbitrary levels 36 and 37; however, because artifacts were analyzed in laboratory by phase, rather than by level or stratum (excepting cases of a few selected contexts, which were confirmed to be unmixed), this did not pose a problem for general material analysis. The Phase 1 occupation begins quite early in the Middle Formative, prior to ca. 1200 BC (see Appendix C).

Stratum UII-XVI: As with the previously excavated occupational levels, a thin lens of ash discovered at the base of Stratum XVB signified the transition between levels on the eastern side of Wall UII-3. Stratum XVI was also lighter and redder in color than the overlaying occupational levels. Stratum XVI is the latest of the occupational levels associated with Phase 1 of the Formative occupation, the earliest occupation in the sequence identified at Area A. Excavated in two arbitrary levels (levels 33B and 34B), this stratum contained low to moderate concentration of small stones, ceramics, and lithics within a compact and clayey matrix that was brown (7.5YR 4/4) in color.

Stratum UII-XVII: This stratum, located on the western side of Wall UII-3, was also separated from Stratum XVB by an ash lens, and was excavated in a single arbitrary level (Level 34A), until another ash lens was encountered. Stratum XVII was a semicompact layer of dark reddish brown (5YR 3/2-7.5YR 3/2) clayey soil. Small whitish inclusions, red clay, yellow soil, and ash

were found dispersed throughout the matrix. This level also included Qaluyu ceramics as well as large quantities of obsidian and some possibly Archaic Period lithic flakes.

Stratum UII-XVIII: Stratum XVIII was separated from the previous levels (Stratum XVI on the eastern side and Stratum XVII on the western side) by an ash lens. Angular gravel of 2-4 cm was found within the clayey, dark reddish brown (7.5YR 4/4 - 5YR 3/4) matrix of the level, as well as smaller pebbles and significant quantities of lithic artifacts. Stratum XVIII was excavated in two arbitrary levels (Levels 35 and 36).

Stratum UII-XIX: While Stratum XIX was the last level excavated in Unit II, it was not culturally sterile. This level contained inclusions of ash and small stones within a semicompact, clay matrix that was dark reddish brown (5YR 3/3 - 4/3) in color. Though few cultural materials were found during the screening of excavated soil, some artifacts of significance were identified, including a large piece of obsidian debitage, a stone *pulidor*, an Archaic chert preform, and two chert flakes. Importantly, the thin layer of ash that separated Stratum XIX from Stratum XVIII was better preserved than in the previously excavated levels, and appeared to contain the remnants of mats woven of cane (*quincha*) or *titora* grass. Ethnographically, we know that residents of the Andean highlands often cover the floors of their domiciles with these mats, known as *estera*, which are used for sleeping, sitting, or other household activities. Local informants indicated that after a period of use, the *estera* are often burned to rid the homes of garbage or pests that collect on the floor surface.

6.3 Trench 1

Excavated during the 2006 field season, Trench 1 was a 4.0 x 1.0 meter test-pit originally intended to investigate the hypothetical retaining wall supporting the principle terrace of Area A. Situated six meters to the west of Unit II, the southwest corner of the trench was located at N100, E86 on the site grid (UTM N8308731 E394816 [WGS 84, 19L]). Trench 1 was excavated in 1 x 1 meter subunits, numbered 1-4, which were arranged in a contiguous line forming a wide trench exposure (Figure 6.11). As with Unit II, all elevations were measured using Datum 1, and as the excavation progressed, the excavation surface was progressively reduced for methodological and safety purposes. Excavation of Trench 1 culminated 3.30 meters below the ground surface with an excavation area of 1 x 2 meters in subunits T1-3 and T1-4, which served to define the earliest levels. During excavation members of the excavation team registered 17 depositional levels, which were composed of 22 arbitrary levels. The most significant find was an Altiplano period slab-cist tomb, which was identified in the southern wall of the trench. The stratigraphy and features found in Trench 1 will be summarized below.

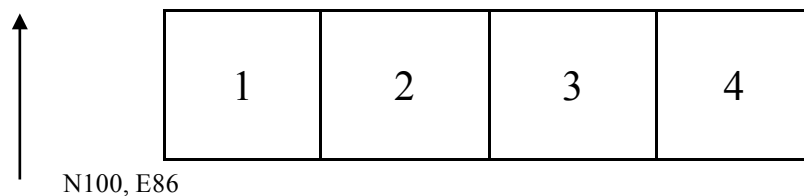


Figure 6.11. Diagram of Trench 1 showing interior subunits

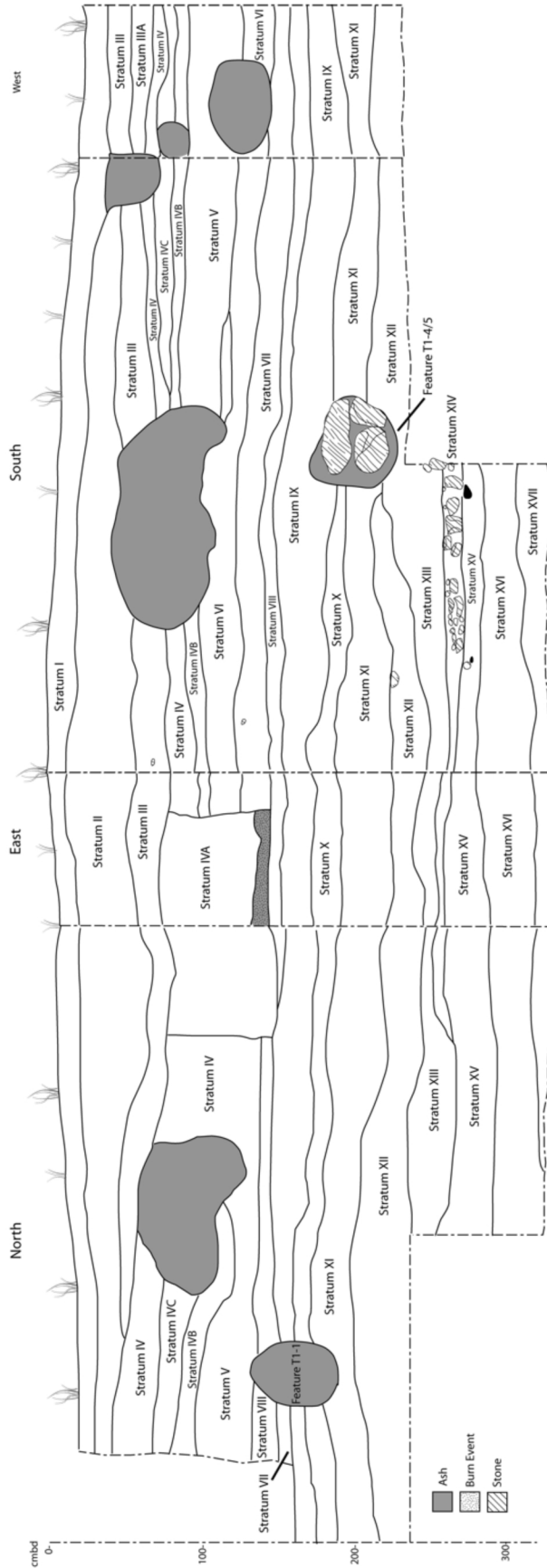


Figure 6.12. Profile drawing of Trench 1.

Stratum T1-I (Level 1): The modern plowzone consisted of friable soil that is currently under cultivation. The matrix was a brown (5YR 5/2-5/3) silty loam, and contained a medium concentration of small stones.

Stratum T1-II (Level 2): Stratum II, another modern depositional level, consisted of a dark (10YR 4/3) matrix containing stones, sand, and ceramic fragments. The soil was generally semicompact (though more compact than the modern plowzone), however the soil was very loose in some areas. These changes can be attributed, in large part, to the presence of many root systems. Some ash was found dispersed throughout the level.

Stratum T1-III (Levels 3 and 4): This was a level of brown (10YR 4/3) compact soil containing inclusions of sand and gravel, as well as a dispersion of ash. Stratum IIIA, as noted in the profile drawing, indicate the areas of Stratum III that were mixed with yellowish ash.

Stratum T1-IV (Level 5): Another level of semicompact, brown (10YR 4/3) soil containing moderate concentrations of sub-rounded gravel and significant amounts of cultural materials. Cultural materials identified during excavation include ceramic, obsidian, lithic flakes and debitage, and groundstone hoes. Large quantities of camelid, bird, and fish remains were also present, as well as a single fragment of deer antler. Stratum IVA was an area exhibiting higher concentrations of burned prepared clay, which was associated with a lens of ash and carbonized materials. Stratum IVB was also very similar to Stratum IV, however it contained elevated concentrations of yellow ash. Stratum IVC consisted of the matrix of Stratum IV mixed with a moderate dispersion of ash.

Stratum T1-V (Level 6 and 7 in T1-1 and T1-2): Stratum V was a level of fine clayey soil that was reddish brown (5YR 5/4) in color. The matrix contained a significant amount of ceramic materials and faunal remains, though relatively fewer lithic artifacts.

Stratum T1-VI: (Levels 6 and 7 in T1-3 and T1-4; Level 8 in all subunits): The brown (10YR 4/3) soil of Stratum VI was semicompact and somewhat sandy with inclusions of small stones. This matrix contained high concentrations of Formative ceramics, including an unpainted ceramic feline face (TA-3106) similar in form to the one discovered in Unit II. This artifact had likely been used to adorn an *incensario* or other ritual ceramic fineware. Smaller quantities of lithics and faunal remains, which included a worked bone tube, were also identified.

Stratum T1-VII (Levels 9 and 10): Though also brown, the soil of Stratum VII was distinguished from the previous level by its lighter color (7.5YR 5/3) and finer texture. This matrix contained a moderate dispersion of Formative ceramics and high concentrations of faunal remains. In T1-4, the easternmost of the four subunits, excavation crews encountered a lens of ash and carbonized materials; this area was later determined to be associated with the base of Stratum IVA, and corresponds with the burn event identified in Units I and II.

Stratum T1-VIII (Level 11): This level was a thin lens of dark yellowish brown ash (10YR 4/4), with both semicompact and loosely compact components.

Stratum T1-IX (Level 12 and 13): Stratum IX was a semicompact layer of brown (10YR 4/3) soil with a moderate dispersion of subangular gravel and low concentrations of cultural materials (ceramics, lithics, and faunal remains). Nevertheless, excavation did yield the significant find of a ceramic trumpet decorated with Pukara-style paint and incision (TA-3157). Stratum IX was also associated with two pit features, Features T1-1 and T1-2, which will be described below.

Feature T1-1: The surface of this pit feature was first detected at the base of Stratum VIII at an elevation of 157 cm below Datum 1, between the subunits T1-1 and T1-2. Located at N101.56/101 E86.80/87.41 on the site grid, the pit was sub-circular in shape, measuring 44 cm (N-S) by 61 cm (E-W) and reaching 17 cm in depth. It was found to contain loosely compacted soil, bone, and ceramics.



Figure 6.13. Features T1-1 (left) and T1-2 (right)

Feature T1-2: This circular pit feature was discovered in the subunit T1-3 at 154 cm below Datum 1 and reached 36.5 cm in depth. Located at N100.29/100.81 E88.90/89.41 on the site grid, the pit measured 52 cm (N-S) by 51 cm (E-W). The pit was primarily filled with angular

cobbles, though some ceramics, several grinding stones, and one bone tool were also found in during the screening of excavated soil.

Stratum T1-X (Level 13): Stratum X was another thin layer of yellowish ash that was associated with Stratum XI and Feature T1-4.

Stratum T1-XI (Level 14 and 15): Stratum XI was a very compact layer of brown (10YR 4/3) soil. Excavation yielded a number of high quality ceramics, including sherds with Pukara-style incised polychrome, as well as broken obsidian projectile points. During excavation, a slab-cist tomb (Feature T1-4) was detected in the southern profile of T1-2 at an elevation of 180 cm below Datum 1. The location and position of Feature T1-4 prohibited further exploration, and so excavation of the tomb was reserved for the 2007 field season.

Stratum T1-XII (Level 15 and 16): The soil of this level was fairly loose and was dark yellowish brown in color (10YR 4/4). Excavation yielded quantities of Formative utilitarian ceramics and burned bones, as well as Pukara style polychrome incised pottery. Stratum XII was associated with a pile of cut stone blocks (Feature T1-3), identified at 202 cm below Datum 1. Unlike Feature T1-2, these stones were not encountered in any sort of pit feature, but were rather found in the matrix of the stratum.

Stratum T1-XIII (Level 17): This level consisted of a sandy clay loam, which was compact and dark brown (7.5YR 3/4) in color. A large fragment of Pukara polychrome pottery was discovered during excavation, along with substantial quantities of undecorated Formative

ceramics and faunal remains. Relatively fewer lithic artifacts were found; these included several groundstone hoes, in addition to other types of stone tools.

Stratum T1-XIV (Level 18): This stratum was a layer of compact, clayey soil that was dark reddish brown (5YR 3/3) in color. During the excavation of subunits T1-3 and T1-4, the excavation crew encountered the remains of an east-west wall at 263 cm below Datum 1. This wall, labeled **Wall T1-1**, was composed of angular cobbles measuring 7-12 cm in size. Based on elevation data, this wall likely corresponds with the Formative Phase 1 construction (Wall UII-3) identified in Unit II.

Stratum T1-XV (Levels 19 and 20): This stratum consisted of dark grayish brown (10YR 3/2) soil containing substantial quantities of Pukara style ceramics.

Stratum T1-XVI (Levels 20 and 21): This stratum consisted of a dark brown (7.5YR 3/2-2.5/2) soil. Excavation yielded ceramics decorated with incision and with back on red painted designs, as well as a fragment of a Qaluyu-style bowl. Overall, the level contained a moderate concentration of Qaluyu ceramics. The north and southeastern corners of the trench contained relatively elevated quantities of faunal remains.

Stratum T1-XVII (Level 22): The final stratum excavated in Trench 1 was composed of a compact, dark (7.5YR 2.5/3-3/3) sandy soil containing few inclusions. Finds included flakes and other lithic debitage, and Formative period ceramics.

6.4 Trench 1A

The excavation of Trench 1A was undertaken during the 2007 field season. Situated at N99 E87 on the site grid, this unit was located just to the south of Trench 1, and immediately adjacent to T1-2 and T1-A (Figure 6.14). Trench 1A was excavated in a single unit measuring 1.0 x 2.0 meters, and was intended to recover a slab-cist tomb (Feature T1-4) that had been identified while excavating of Trench 1 during the 2006 field season. The feature had been discovered while drawing the southern profile of T1-2, at an elevation of 180-221 cm below Datum 1. Due to its position and location, it had been impossible to reach, and so investigation of the feature was reserved for future field season. In order to preserve the tomb and its contents, Trench 1 was backfilled at the completion of the 2006 field season. Unfortunately, due to time constraints, it was not possible to identify the depositional levels represented in the Trench 1A, and so only the description of the strata and their corresponding arbitrary levels will be presented here.

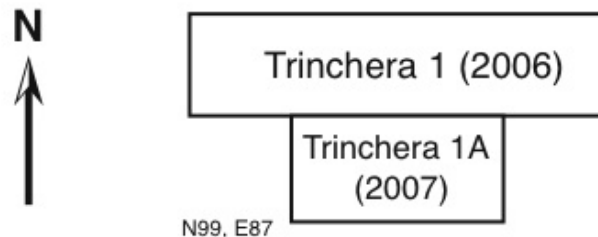


Figure 6.14. Location of Trench 1A in relation to Trench 1.

Stratum T1A-I (Level 1): Stratum I was the modern plowzone, and was under cultivation at the time of excavation. The semicompact, brown (7.5YR 4/3) soil was silty and contained medium-sized angular gravel and many roots. As expected in the plowzone, the level also contained ceramics from all occupational phases, including Formative up through the modern day, as well as relatively lower concentrations of faunal remains, lithic artifacts, and obsidian flakes.

Stratum T1A-II (Level 2): The second layer identified consisted of a semicompact, brown (7.5YR 4/3) silty soil containing fine sand, fine and medium-sized gravel, and <3% small stones. This level contained an abundance of cultural materials, including ceramics, faunal remains, and lithic artifacts, as well as a piece of worked bone, which had been burned.

Stratum T1A-III: This was a thin lens of semicompact ashy soil (10YR 4/3) with inclusions of clay and small stones, as well as <1% cultural materials, such as bone and ceramic.

Stratum T1A-IV (Level 3): Stratum IV was a layer of semicompact brown (7.5YR 4/3) soil containing a high density of gravel and burned clay inclusions. Relative to ceramics, comparably few lithic artifacts and faunal remains were found in this level; however excavation did yield a few groundstone agricultural implements as well as a significant quantity of obsidian debitage.

Stratum T1A-V: Represented only in the western profile, Stratum V was an area of loosely compacted, fine silty soil (7.5YR 4/3) with gravel inclusions.

Stratum T1A-VI (Level 4): This layer of brown (7.5YR 4/3) semicompact soil was silty with inclusions of fine sand. This matrix contained 10-20% small to medium angular gravel, as well as a high density of cultural materials, including ceramics, groundstone hoes, obsidian, and worked bone tools.

Stratum T1A-VII: Stratum VII was a lens of ashy soil (10YR 5/3). The matrix contained low concentrations of fine sand and <5% gravel inclusions.

Stratum T1A-VIII (Level 5): This level consisted of semicompact silty soil with inclusions of carbon, clay, and small stones (5YR 5/3).

Stratum T1A-IX (Level 6): This layer consisted of silty soil mixed with yellowish ash (10YR 5/4) that was semi- to loosely compacted. This matrix contained flecks of carbon, small stones, and clay inclusions. Cultural finds were relatively sparse in comparison with previously excavated levels, and included ceramics (approximately 1% of excavated soil), bone, lithic artifacts, obsidian, and stone flakes.

Stratum T1A-X (Levels 7 and 8): This level was distinguished from the previous one by its reddish hue (5YR 4/3), and relatively higher concentration of fine and medium-sized gravel (10%). This matrix was comprised of silty soil with inclusions of fine sand and small stones. An area containing burned red clay (small, medium, and large-sized) was identified on the eastern side of the unit, while the center of the unit contained elevated amounts of carbonized material. Excavation yielded dispersed quantities of ceramic sherds and faunal remains, as well as increased amounts of lithic artifacts, relative to previously excavated levels. Obsidian debitage and a piece of worked bone were also recovered.

Stratum T1A-XI (Level 9): This level of yellowish (2.5Y 5/4), silty soil contained inclusions of carbon, pieces of burned red clay (small to medium-sized), and subangular gravel (10%). This

matrix contained a moderate dispersion of cultural materials, such as ceramic and bone, as well as lithic artifacts and obsidian. At the base of Stratum XI, 128 cm below Datum 1, the excavation crew identified the surface of a pit feature, labeled Feature T1-5 (in continuation of the feature numbers from the excavation of Trench 1, as Trench 1A was considered as an annex, rather than a completely separate excavation unit). As work progressed, this pit was determined to be a part of Feature T1-4, the slab cist tomb that was the objective of excavation in Trench 1A. Because the pit actually contained the slab cist tomb, these features were combined and subsequently renamed Feature T1-4/5.

Feature T1-4/5: This feature was a pit containing a slab-cist tomb. These types of mortuary features are often associated with the Altiplano phase occupation of the northern Titicaca area, and so it is likely that Feature T1-4/5 also dates to the Late Intermediate Period. Located at N: 99.14/99.78 E: 87.62/88.25 on the site grid, the pit was nearly circular, with its dimensions measuring 60 cm (N-S) by 65 cm (E-W). The surface of the pit, identified at 128 cm below Datum 1, was marked by a large stone block measuring 30 x 30 cm, as well as two holes along the southeastern side of its circumference. As excavation progressed it was determined that the two holes identified on the surface of the pit actually continued all the way down to the slab cist, and were canted towards the northeast. The soil on the interior of the pit, excavated as Level 10A, was very soft and fine in comparison with the surrounding matrix, and was brown (7.5YR 4/3) in color. This soil was mixed with ash and contained substantial quantities of burned red clay, bone, and flecks of carbon, as well as scattered fragments of bone and ceramic. Forty centimeters below the surface of the pit the soil took on a yellowish tint, though the texture remained the same. A series of large stones were exposed in the pit beginning at 148 cm below

Datum 1, and in order to maintain vertical control over excavated finds, all soil below these stones was excavated as Level 10B. Continued excavation of level 10B yielded more worked stone blocks, elevated concentrations of animal bone and fish scales, which had all been burned, as well as a Type 5C obsidian projectile point (TA-5283).



Figure 6.15. Slab-cist tomb (Feature T1-5) inside of pit feature T1-4.

The stone cist (Feature T1-4) was exposed at 184 cm below Datum 1, and was composed two courses of stone blocks measuring 25-50 cm in length, and its dimensions measured 72 (SE-NW) x 78 (SW-NE) cm. This cist contained a single hyperflexed adult male with the head oriented towards the northeast, and the body folded tightly at the elbows and knees (Figure 6.15). Sex was determined in the field based on pelvic morphology. This individual also exhibited annular type cranial modification. The body was associated with several very small—likely rodent—bones; however, other than a few ceramics found dispersed through the fill, the tomb had no material associations. The base of the tomb was reached at 234 cm below Datum 1.

6.5 Profiles I and II

Following the 2006 field season it was determined that Area A could not be sampled efficiently using random quadrants owing to the depths of the cultural deposits. In 2007, excavations followed a modified transect sampling strategy (Flanner 1976: 68-72). Two existing profiles provided an east-west cross-section of the mound. Profile I, located 20 meters north of the 2006 excavation area, had been created by the removal of earth by local farmers for making mud bricks. Profile II, located by the edge of the Río Rámis (and 20 meters to the north of Profile I), was an area of the mound that had been eroded by river activity. Thirty-five meters of each of these profiles were made vertical and cleaned so that stratigraphy and visible features, including walls, floors, pits, and burials, could be drawn. Because both of the profiles were irregularly shaped, Profiles I and II were cleaned in 2.00-meter subprofiles¹¹ in order to avoid removing too much soil during the cleaning process. These subprofiles were then measured in relation to an east-west reference line in order to record their exact location and orientation. This method proved extremely effective for the recovery of archaeological data; in total, 11 stone buildings and 11 features¹² were exposed and recorded, along with all visible strata.

Significantly, these two profiles revealed that the occupational sequence discovered in the previous 2004 and 2006 seasons was actually an example of a general pattern repeated across a very large area of the terrace. In addition, six more stone foundations dating to the Upper Formative were exposed in Profile I (Structures PI-1, PI-4, PI-5, PI-6A/6B, PI-7, and PI-8). Following the pattern first documented by Stanish in 2004, one of these structures (PI-8) was associated with a headless individual (Burial PI-1), who had been interred as a dedicatory

¹¹ Subprofiles measured 2.00 meters when possible; there were some instances in which the actual length of the profiles measured slightly more or slightly less owing to the irregularity of the topography of the preexisting profiles.

¹² This figure includes 10 features and one human burial. Note that there is no Feature PII-10.

offering under the building's stone foundation. Another building (Structure PI-7) was associated with a burned roof and burned roof beam (Feature PI-6), which were identical in form to Feature UII-10 discovered in 2006. A second burned roof (Feature PI-8) was found in association with a prepared clay floor (Stratum PI-XXXIV), although no stone architecture was apparent.

6.5.1 Profile I

In Profile I, subprofiles were numbered PI-1 through PI-17, and the reference line for this profile was situated at N120 E118 on the site grid (UTM N8308751 E394849 [WGS 84, 19L]). Elevations were again measured from Datum 1 (UTM N8308742 E394831; alt: 3822.325 m.a.s.l). In total, the cleaning of Profile I revealed seven distinct depositional levels that correspond with six occupational phases dating from the Upper Formative Period. These depositional levels represent all but one of those that had been defined during the excavation of Unit II, and all of the occupational phases between Formative Phase 3 and the modern day are represented. A description of the stratigraphy and features exposed in this profile are presented below; these correspond with the illustration of Profile I (Supplementary Material 1). Due to the size and the complexity of Profile I, the data are grouped by occupational phase.

Occupational Phase 1: Modern Surface

Stratum PI-I: This level corresponds with the modern plowzone of Area A, and stretches across the entire length of Profile I. As this soil is currently under cultivation by the landowners, the soil is arable and contains a high level of root activity. The matrix is fine and semicompact, and dark brown in color (7.5YR 3/2), and was found to contain a moderate density of rounded

pebbles. Stratum I was associated with a number of features, including architecture and trash pits. These are listed from east to west, and detail the subprofile in which they were discovered.

Structure PI-3 (Profile I-3): The stone foundation of Structure PI-3 was composed of six courses of unworked stones. The structure was associated with several floor levels that were interspersed with lenses of ash. Forms of adobes (10YR 6/3, 6/4), as well as evidence of a degraded adobe superstructure, were identified on the eastern side of the wall. A pit (Feature PI-2) was discovered abutting the wall on its western side. Structure PI-3 was situated at 130 cm below Datum 1, and measured 50 cm tall. The stratigraphic position suggests that this structure was built extremely late in the site's chronology, and is likely no older than the Late Horizon.

Feature PI-2 (Profile I-3): This trash pit was discovered immediately adjacent to Structure PI-3, on the western side of the wall, at an elevation of 124 cm below Datum 1. It measured 30 cm wide and was 60 cm deep. The soil of the pit was very soft and loosely compacted, and was largely overrun with roots. This matrix was found to contain a high concentration of cultural materials, including large quantities of ceramics, burned animal bones, large flecks of carbon, and burned clay. A thin layer of ash lay at the base of the pit.

Feature PI-3 (Profile I-5): This trash pit was identified at 141 cm below Datum 1. Measuring 100 cm wide and 69 cm deep, its proximity to the modern ground surface (13 cm) suggests that it dates to the modern day, or the very recent past. The interior of the pit was composed of an ashy soil (7.5YR 5/2) that contained substantial quantities of burned earth and clay, angular stones averaging 10 cm in size, bone, and ceramic.

Feature PI-7 (Profile I-8): This trash pit, situated at 180 cm below Datum 1, contained a series of layers of ashy soil. Each of these layers was a different color; from the surface of the pit, the colors of the strata were 10YR 5/2, 10YR 4/2, 7.5YR 5/2, 5YR 5/2. This pit was also found to contain a number of examples of fine Inka pottery were also found, suggesting a Late Horizon affiliation for the feature.

Occupational Phase 2: Modern/Colonial fill

Stratum PI-II: This layer was distinguished from Stratum I by its relatively lighter and yellower color. The brown (7.5YR 4/3) soil of Stratum II was silty and semicompact, containing a moderate dispersion of gravel.

Stratum PI-XVII: This layer consisted of semicompact, clayey soil with a silt component. This dark grayish brown (10YR 4/2) matrix contained inclusions of red (5YR 5/4) clay inclusions, as well as flecks of carbon; however, it contained little in the way of gravel or stones.

Stratum PI-XLVI: With a matrix composed of silty loam, this dark brown layer (7.5YR 3/2) contained fine sand and a moderate dispersion of small stones, but few other inclusions. The soil was very loosely compacted, suggesting Stratum XLVI had been part of a pit feature.

Occupational Phase 3: Inka/Colonial Domestic Occupation

Stratum PI-IV: Stratum IV was composed of a semicompact, sandy soil that was brown (7.5YR 4/2) in color. This matrix contained low levels of silt, and exhibited a granulated texture. Stratum IV was situated immediately on top of Feature PI-1, and likely had been part of the original *tapia* (tamped adobe) superstructure that had been associated with that feature's floors.

Feature PI-1 (Profile I-1): This feature, situated at 100 cm below Datum 1, was a domestic structure containing a number of floor levels. East to west, the structure measured 60 cm; however, only the portion of the feature present in Profile I-1 could be measured, and so this value likely under represents the total size of the structure. The feature contained a series of floor levels that were separated from one another by lenses of ash. These floors were composed of fine, compact soil that was much lighter in color (7.5YR 4/3) than Stratum III, which was located immediately to the west of the feature. The interspersing lenses of soft ash (10YR 5/2) were relatively uniform in their thickness. On top of this series of floors was a thick layer of compact sandy soil that appeared to have been prepared in some fashion prior to its deposit. This layer (Stratum IV) was likely part of a *tapia* (tamped adobe) superstructure associated with the floors. Stratigraphy suggests an Inka or Colonial affiliation for this structure, which was intrusive to the underlying Formative deposits.

Stratum PI-XL: This designates an area where the soil was mixed with substantial quantities of ash. The soil of Stratum XL was loosely compacted and dark grayish brown (10YR 4/2) in color.

Stratum PI-XLI: This layer was a compact lens of fine, silty soil that was brown in color (10YR 5/4).

Stratum PI-XLVII: A very loosely compacted crumbly block of soil, Stratum XLVII was likely originally deposited as part of XLII, but was disturbed in the subsequent occupational phase.

Occupational Phase 4: Altiplano (Collao)/Inka

Stratum PI-III: This layer of fill was dark brown (10YR 3/2- 7.5YR 3/2) and compact, and was especially distinct due to its many whitish inclusions. Stratum III contained dispersed flecks of carbonized materials and low concentrations of stones, as well as a moderate concentration of Formative ceramics.

Stratum PI-IX: This fill layer was very similar to Stratum V, and consisted of compact, silty loam with 20% sand with inclusions of fine and very fine gravel. The general matrix was brown (10YR 4/3) in color.

Stratum PI-XLII: A hard, compact layer composed of silty soil with sand inclusions and 5-7% subangular and subround stones. The matrix was dark brown (7.5YR 3/2) in color.

Stratum PI-V: A fill layer, Stratum V was composed of compact silty soil containing pieces of burned red clay and angular stones measuring 2-4 cm. This dark brown (7.5YR 3/3) matrix was found to contain a moderate dispersion of gravel, bone, and ceramic.

Stratum PI-LII: This area of soil was very similar to Stratum XLII, but was lighter and yellower in color. The matrix was very hard and compact, and was composed of a mixture of silt, sand, and clay that was brown (10YR 4/3-3/3) in color.

Occupational Phase 5: Huaña; domestic occupation and fill

Occupational surface:

Stratum PI-XV: Stratum XV was an activity surface dating to the Huaña period and corresponding with Stratum UII-V from Unit II. The semicompact floor matrix consisted of a silty clay loam with 5% gravel and dispersed flecks of carbon, and was brown (7.5YR 4/2) in color.

Fill:

Stratum PI-V: This stratum was a compact layer of fill with a variety of inclusions. The general matrix was composed of a dark brown (7.5YR 3/3) silty loam with inclusions of gravel and angular stones measuring 2-4 cm. This matrix contained a moderate density of bone and ceramic fragments, as well as bits of burned clay.

Stratum PI-VIII: The brown (7.5YR 4/2-4/3) matrix of Stratum PI-VIII was granular and loosely compacted, and contained moderate quantities of sub-round pebbles, as well as Formative ceramics. While the texture of this fill layer was similar to Stratum PI-VI (described below in Occupational Phase 6), it lacked the distinctive carbon inclusions. Structure PI-2, a stone architectural feature, was discovered in association with Stratum PI-VIII.

Structure PI-2 (Profile I-2): This feature was very similar in form to Feature T1-4/5, excavated in Trench 1A. It was composed of sub-rectangular stone blocks of variable size; these had been arranged in the form of a semi-circle with a diameter of 80 cm. The uppermost stones of the feature measured 175 cm below Datum 1. It is likely that the stones once composed the southern side of a complete circle (a cist), however the removal of earth from the terrace to make adobes would have disturbed the blocks on the northern side of the feature. Unlike the slab-cist tomb excavated in Trench 1A, Structure PI-2 had no skeletal nor material associations; therefore it is unclear if the cist had been used as a tomb or simply for storage. Importantly, this structure was intrusive into the Stratum PI-VI, clearly indicating that its construction was post-Formative.



Figure 6.16. Profile I-2, Structure PI-2

Stratum PI-XIII: Stratum PI-XIII was a semicompact layer of brown (7.5YR 5/2) sandy soil with inclusions of carbon.

Stratum PI-XVI: A semicompact layer of dark grayish brown (10YR 4/2) silty clay loam containing 5% gravel, as well as inclusions of pebbles and carbon.

Stratum PI-XX: Hard and compact brown (7.5YR 4/3) silty loam with inclusions of gravel and small stones. Stratum PI-XX was associated with a thermal feature, Feature PI-4)

Feature PI-4 (Profile I-5): Measuring 68 cm east-west, this feature was a very dark ash lens associated with substantial quantities of burned mud and/or prepared clay. While much of the burned mud/clay was situated on top of the ash, several large clods of burned earth—easily recognizable by their bright red-orange color (5YR 5/6)—were actually mixed in with the carbonized material. A significant amount of carbonized dung was also identified within the matrix of the feature. The thickness of this feature (14 cm), together with its well-defined boundaries, suggests that Feature PI-4 was actually a shallow pit that had been excavated into the ground (or fill) and used as a hearth or earth oven, rather than the remains of a fire that had been kindled upon the ground surface itself.

Stratum PI-XXV: The soil of this layer was a loosely compacted, brown (10YR 4/3) silty clay loam with inclusions of yellowish red (5YR 5/6) burned earth. This matrix contained a moderate concentration of stones and gravel. Stratum PI-XXV was associated with a thermal feature that was very similar to Feature PI-4, and will be described in detail below.

Feature PI-5 (Profile I-6): Situated at 195 cm below Datum 1, this feature was another shallow pit measuring 14 cm in depth and containing a dark ashy matrix mixed with many large clods of burned earth. As was the case with Feature PI-4, the matrix of this pit also contained substantial quantities of carbonized dung. Close inspection indicated that this pit had actually been excavated into the Stratum PI-XXV around the time that the fill was deposited, as no evidence of soil disturbance was detected.

Stratum PI-XXVI: Loosely compacted silty clay loam (10YR 4/3) with some minor inclusions of burned earth and fine gravel.

Stratum PI-XXXII: Loosely compacted silty clay loam with inclusions of burned earth and small stones. This layer was distinguished by its color; it contained a mixture of brown (10YR 5/3) and yellowish soils.

Stratum PI-XXXV: This stratum was composed of reddish, sandy loam mixed with ash (5YR 4/2). This semicompact matrix contained dispersed flecks of carbon, and well as inclusions of burned clay.

Stratum PI-XXXVII: This was a semicompact fill layer composed of brown (10YR 4/3) silty loam with sand inclusions and a low (<5%) dispersion of stones.

Stratum PI-XXXIX: Relatively lighter in color, this stratum was actually located immediately underneath the plowzone (Stratum PI-I), as Occupational Phases 2-4 were not present in this area

of the terrace. The matrix was composed of a brown (7.5YR 5/3) semicompact, silty clay loam with inclusions of angular stones measuring 4-7 cm in size.

Stratum PI-XLIII: A multicolored (though the general color was 7.5YR 4/3) fill layer containing many types of cultural materials, including ceramic fragments and faunal remains. Pieces of burned clay, angular and subangular stones were also found within the matrix.

Stratum PI-XLVIII: A fill layer very similar in composition to Stratum PI-XLII, but substantially less compacted, and with relatively greater quantities of carbon. This stratum was composed of fine, loosely compacted soil containing dispersed flecks of carbon and 10-15% cultural materials, which included fragments of bone and ceramic. Several large stone blocks measuring 15-20 cm were also noted in this level.

Stratum PI-XLIX: This layer was composed of a loosely compacted, sandy soil that was brown in color (7.5YR 5/2-4/2). The general matrix was poorly sorted, containing coarse, medium, and fine-sized gravel inclusions (angular and subangular), fine and very fine sand, and ash. Stratum PI-XLIX also contained several stone blocks measuring 10-15 cm and 5-10 cm, as well as a medium dispersion of cultural materials, including ceramic sherds and faunal remains. Stratum PI-XLIXA refers to the part of this stratum containing elevated concentrations of ash.

Stratum PI-L: Fill layer composed of sandy, silty soil that was brown in color (7.5YR 4/2). The matrix exhibited a moderate degree of sorting, and contained 10-15% subrounded and subangular gravel, as well as 10% coarse sand.

Stratum PI-LI: Semicompact, sandy, silty fill layer containing fine sand and minute amounts of clay. The brown (7.5YR 5/4) matrix was well sorted and contained 5% sub-angular gravel.

Stratum PI-LIII: An area of brown (7.5YR 4/2) semicompact, granulated soil composed of a silty clay matrix with 15% inclusions of medium-sized, sub-angular gravel.

Occupational Phase 6: Formative Phase 3 Occupation (Upper Formative)

Burn event:

The following strata correspond with the burn event identified during the excavation of the Formative Phase 3 occupation of Unit II.

Stratum VI: This layer of loosely compacted, dark brown (7.5YR 3/2) soil was partially mixed with substantial quantities of ash. This matrix contained inclusions of burned red clay (2.5YR 5/6). Stratum VI likely corresponds with the thick ash layer identified during the excavation of Unit II, and therefore represents the continuation of the Formative Phase 3 burn event. As was the case in Unit II, this ashy layer was found to be covering three architectural features made of finely cut stone, suggesting an important pattern for the Phase 3 occupation of Area A.

Structure PI-1 (Profile I-1): This east-west wall of a stone structure was composed of a double course of cut stone blocks measuring 30-40 cm, and was situated at an elevation of 249.5-259 cm below Datum 1 (Figure 6.17). No evidence of any sort of fill was found between the stones. The structure was associated with a soft ash layer (Stratum VI), which was part of the burn event

originally defined in excavation Units I and II. Based on this stratigraphic information, Structure PI-1 likely dates to the early Pukara period.



Figure 6.17. Structure PI-1

Structure PI-4 (Profile I-3): Also dating to the early part of the Upper Formative, Structure PI-4 was represented by a destroyed wall composed of subangular blocks measuring 10-20 cm. The top of this rubble was situated at 208 cm below Datum 1. The remains of Structure PI-4 were associated with an ashy layer (Stratum VI), in addition to forms of adobes, which were distinguished by their colors (10YR 6/4, 6/3) and texture, as well as prepared clay floor (Stratum XIV), which will be described in detail below.

Structure PI-5 (Profile I-3): The remains of Structure PI-5 consisted of a few cut stone blocks, which were situated at 216 cm below Datum 1. While no formal architecture could be discerned from the visible remains, the stone blocks were similar in form and size to those that composed Structures UII-1 and PI-1. These stones were associated with the ash layer (Stratum PI-VI) and a prepared clay floor (Stratum PI-XIV).

Stratum PI-VII: This layer was very similar to Stratum PI-VII, but with greater concentrations of ash, which lent it a gray color (10YR 3/2). The soil was fairly soft and contained a high density of carbon flecks.

Stratum PI-X: A layer of fine, soft brown (10YR 4/3) soil mixed with substantial quantities of ash. The matrix contained inclusions of carbon flecks as well as pieces of burned clay.

Stratum PI-XI: This layer was composed of dark grayish brown (10YR 4/2) silty loam mixed with pieces of burned red clay (5YR 5/8), carbon, and ash. The matrix also contained some sand inclusions. Stratum PI-XI was distinct from the surrounding strata, containing relatively higher concentrations of carbon than Stratum PI-X, but relatively lower amounts than Stratum PI-XII.

Stratum PI-XII: An area of soil with very high concentrations of carbon flecks and very substantial quantities of ash. The dark grayish brown (10YR 4/2) matrix also contained pieces of burned red clay, but in relatively lower concentrations than Stratum PI-X and PI-XI.

Stratum PI-XXXVI: This layer of reddish brown (5YR 4/4) sandy clay loam was fairly compact and contained inclusions of burned earth.

Stratum PI-XXXVIII: A loosely compacted layer of soil mixed with moderate quantities of ash, burned earth, and carbon flecks. The general matrix had a granular texture and was composed of silty loam with inclusions of sand and clay. Where clay was present in elevated

concentrations, the brown (7.5YR 4/3) matrix appeared redder and lighter in color. This layer was internally stratified, containing areas where the texture or color of the soil was distinct, despite overall compositional similarities with the surrounding matrix. These areas were each assigned a letter, and are listed below:

- A:** The soil of Stratum PI-XXXVIII A was much softer than the surrounding matrix.
- B:** This part of the stratum contained elevated concentrations of ash and burned earth, and was very loosely compacted.
- C:** This area was redder and lighter in color than the general matrix (7.5YR 5/3-5/4)
- D:** This area was and lighter in color than the general matrix (7.5YR 5/3-5/4)
- E:** This area contained elevated concentrations of ash.
- F:** This part of the stratum contained elevated concentrations of ash and burned earth.
- G:** This area contained elevated concentrations of ash.

Domestic occupation:

The following strata correspond with the domestic deposits associated with the Formative Phase 3 occupation of Area A, as defined during the excavation of Unit II.

Stratum PI-XIV: Floor level. The matrix of this floor was composed of a reddish brown (5YR 4/3), semi-compact, silty clay loam with a few dispersed carbon inclusions.

Stratum PI-XVIII: Floor level. Hard, compact stratum composed of grayish brown (10YR 5/2) silty clay loam with dispersed pebble inclusions.

Stratum PI-XXIX: This level shared many characteristics with Stratum PI-XVIII, but was not as hard or as compact. It was composed of silty clay loam that was dark grayish brown (10YR 4/2) in color. Small pebbles and flecks of carbon were found dispersed throughout the matrix.

Stratum PI-XXI: This stratum was composed of semi-compact, brown (10YR 4/3) silty clay loam with inclusions of carbon and bits of burned clay.

Stratum PI-XXII: This floor level was composed brown compact, silty soil that was brown (7.5YR 5/3) in color. Dispersed pebbles were found within the matrix, however, the stratum contained few other inclusions.

Stratum PI-XXIII: Floor level. As with the floors already described, this level was composed of silty clay loam that was hard and compact. The matrix, which contained some sand and pebbles, was brown in color (10YR 5/3).

Stratum PI-XXIV: This semi-compact layer was composed of silty clay loam that was brown (7.5YR 5/3) in color and contained a light dispersion of pebbles.

Stratum PI-XXVII: Floor level. This stratum was composed of compact brown (10YR 5/3) silty clay loam, with small pieces of bright red burned earth scattered throughout the matrix. The matrix also contained small and larger-sized pebbles, but in very low frequencies. In Profile I-6,

this floor was associated with an early Pukara stone architectural feature, which will be described below.

Structure PI-6A/6B (Profile I-6): Structures PI-6A and PI-6B, located at a depth of 230 cm below Datum 1, were two groups of sub-rectangular cut stone blocks; these were determined to be part of the same structure. The space between PI-6A and PI-6B was interpreted as the interior of the structure, and from east to west, this distance measured 70-90 cm. A series of floors, which were separated from one another by ash lenses, were visible in the profile of this area. Based on formal attributes and stratigraphic associations, Structure PI-6A/6B dates to the early part of the Upper Formative Period.

Stratum PI-XXVIII: This loosely compacted stratum was distinguished by its significant ash content. The soil of the layer was composed of brown (10YR 5/3) silty clay loam with coarse sand inclusions. This matrix contained substantial quantities of ash, as well pieces of burned earth, flecks of carbon, and small stones.

Stratum PI-XXIX: Floor level composed of silty clay loam. The brown (10YR 5/3) soil matrix was semi-compact with some inclusions of small pebbles.

Stratum PI-XXX: Silty, clayey soil mixed with substantial quantities of ash. The brown (10YR 4/3) soil matrix was semicompact and contained dispersed pebble inclusions.

Stratum PI-XXXI: Floor level. The soil of this stratum was composed of a slightly soft, silty clay loam that was brown in color (10YR 5/3). The matrix contained few inclusions apart from a light dispersion of pebbles.

Stratum PI-XXXIII: This layer was much softer and lighter in color than the overlaying Stratum PI-XXV. The soil matrix was composed of brown (10YR 5/3) clayey silt, and contained pebbles and small stones.

Stratum PI-XXXIV: A reddish brown (5YR 4/4-5/4) floor level composed of fine, clayey soil that was very hard and compact. The matrix was fairly well sorted, and contained few inclusions aside from a few scattered pebbles, small stones, and fragments of Formative ceramics. This floor was associated with three important finds: a stone enclosure (Structure PI-7), and two burned roofs (Features PI-6 and PI-8).

Structure PI-7 (Profiles I-7, I-8): The cleaning of Profiles I-7 and I-8 revealed a series of stones that extended north of the profile. Excavation crews followed these stones, ultimately exposing a part of a large architectural feature situated at an elevation of 254.5-268 cm below Datum 1. Composed of a single course of sub-rectangular cut stone blocks and adobe bricks, Structure PI-7 was oriented southwest-northeast, and, based on the visible remains, contained at least two rectangular compartments. Degraded adobe, once part of the superstructure, was identified on top of the stone blocks. A thin layer of ash was also discovered on the western corner of the eastern compartment (in Profile I-7). Structure PI-7 was found to be associated with a roof and a roof beam (Feature PI-6), which had both been burned, as well as a prepared

clay floor that was reddish in color (Stratum PI-XXXIV). A single piece of obsidian debitage (TA-5039) was found on the surface of the floor. In order to obtain a sample from the interior of the structure, we excavated a 50 (north-south) x 150 (east-west) cm area of the floor to a depth of 5 cm. This excavation yielded a fragment of red Pukara-style pottery, a single piece of chert debitage, and a stone polisher (*pulidor*), as well as two bone fragments.

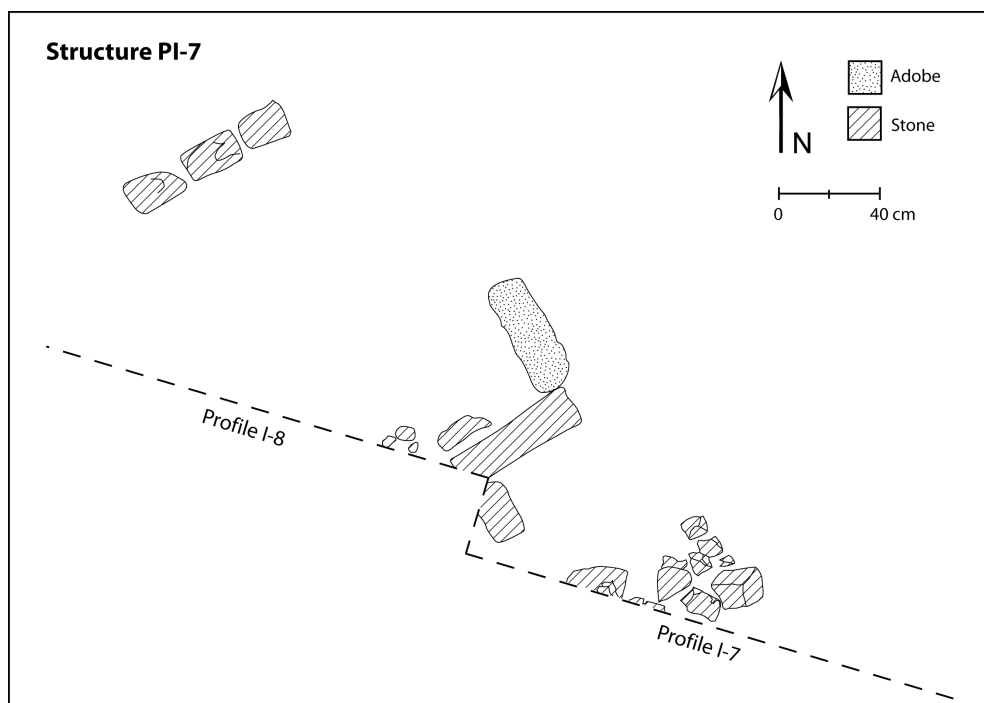


Figure 6.18. Structure PI-7

Feature PI-6 (Profile I-8): This burned roof associated with Structure PI-7 was located at a depth of 230 cm below Datum 1, and measured 66 cm in length. Importantly, Feature PI-6 shared many characteristics with the roof (Feature UII-10) discovered in Unit II. In the profile, this feature appeared as a thick line of black, burned *paja*. A charred wooden post measuring 5 cm in diameter was identified in the center of the *paja* layer. A thin layer of prepared mud, now burnt and orange in color (5YR 5/6), was found on top of the *paja*. Interestingly, where this mud was not present (on the western side of the feature) it appeared that ceramic sherds, carefully

placed on top of the *paja* layer, served as a substitute, not unlike a roof tile. Underneath the charred *paja* was a very fine lens of white ash; close examination indicated that this was also *paja*, as the form of the fibers had actually been preserved in some areas of the layer. Samples of charred *paja* (TA-5104 and TA-5105) and the roof beam (TA-5103 and TA-5106) were taken from the feature for radiocarbon analysis (see Appendix XXX). Results indicate that the roof was burned in the first century AD.

Feature PI-8 (Profile I-9, I-10): This was the second burned roof associated with the floor level Stratum PI-XXXIV. Located at 230 cm below Datum 1, the roof measured 174 cm in length. Feature PI-8 was nearly identical in form to Feature PI-6; however, it lacked any evidence of roof beams or posts. The feature was composed of a layer of black, burned *paja*. In the center of this layer there was a thin lens of white *paja* ash. Both the black and white layers had been capped with prepared mud, which, due to the burn event, was now baked to an orange color. This feature, unlike the other two roofs described, was not associated with architecture of any kind.

Stratum PI-XLIV: Floor level (see Stratum PI-XXXIV) associated with a stone architectural feature, which was exposed during the cleaning of Profiles I-10 and I-11.

Structure PI-8 (Profile I-10, I-11): Located at a depth of 254-268 cm below Datum 1, the exposed portion of Structure PI-8 measured 212 (east-west) x 84 cm (north-south). The visible segment of the stone foundation consisted of a double course wall, composed of worked stone blocks measuring 40-80 cm in size, that had an east-west orientation. Underneath this wall,

excavation crews discovered human skeletal remains, which, upon further excavation, were determined to belong to a headless individual (Burial PI-1) who had likely been interred as a dedicatory offering to the building.

Burial PI-I (Profile I-10, I-11): This burial was a single individual who had been interred underneath the stone foundation of Structure PI-8, possibly as a dedicatory offering. The body was aligned east-west, with the lower extremities oriented towards the east. Floor surfaces (Stratum PI-XXXIV and PI-XLIV) had been deposited on top of the burial, effectively sealing it underground in a soft brownish soil matrix that was distinct from the surrounding floor matrix. Excavation revealed that this individual was missing both the head and the left arm. Analysis of the mortuary context indicated that while the missing left limb likely resulted from the modern removal of soil for the production of adobe bricks, the burial was purposely headless—the space where the head should have been, the excavation crew found only undisturbed compact floor, rather than a continuation of the soft soil matrix that surrounded the rest of the body. Furthermore, the head, if it had been present, did not extend sufficiently northward to have been accidentally displaced by modern activity. Based on the size of the long bones and incomplete fusion of the humeral epiphyses, the skeleton was determined to belong to a juvenile (though not a very small child). Due to the young age of the skeleton, sex could not be determined, though future analysis by an expert may resolve this issue. Burial PI-I may have been a secondary burial, as some disarticulation is evident in the hands and feet, which were located in areas that show no signs of any type of post-depositional disturbance (unlike the missing left arm). The skeletal remains had virtually no material associations, excepting a single fragment of red Pukara-style pottery.



Figure 6.19. Burial PI-1

Stratum PI-XLV: Semicompact brown (7.5YR 4/3) silty clay loam containing inclusions of sand, ash, and a moderate dispersion of bone and ceramic. Low quantities of stone and gravel were also detected.

6.5.2 Profile II

Profile II was located approximately 20 meters to the north of Profile I. As with Profile I, Profile II was cleaned in 2.00 meter subprofiles due to the irregularity of the existing river cut. In Profile II, subprofiles were numbered PI-1 through PI-18, and the reference line for this profile was situated at N138 E118 on the site grid (UTM N8308772 E394867 [WGS 84, 19L]). Elevations were measured from Datum 2 (UTM N8308772 E394867 [WGS 84, 19L]; altitude: 3818.786 m.a.s.l.). The cleaning of Profile II exposed 52 unique strata corresponding with 13 depositional levels that included the earliest phases of the mound's occupation. Three of these depositional levels were determined to be culturally sterile. Of the eight occupational phases defined during the excavation of Unit II, only one—Formative Phase 3—was not represented in the stratigraphy of Profile II. A description of the stratigraphy and features exposed in this

profile are presented below; these correspond with the illustration of Profile II presented in Supplementary Material 2. While the feature numbers were continued from Profile I (starting with Feature PII-9), the numbers for the strata in Profile II were not. Due to the size and the complexity of Profile II, the data are grouped by occupational phase.

Occupational Phase 1: Modern Plowzone

Stratum PII-I: The modern plowzone was composed of silty, semicompact soil that was brown in color (7.5YR 4/4). This soil matrix contained various inclusions, such as large non-human bone fragments, ceramic sherds, root systems, and modern trash. This level was associated with a trash pit, Feature PII-9.

Feature PII-9 (Profile II-13, 14): This was a large modern trash pit was situated 14 cm below the modern surface (56 cm below Datum 2) and measured 230 cm across (east-west). The pit contained a soft ashy matrix that was gray in color (5YR 5/1).

Stratum PII-LI: This stratum of clayey soil contained some silt and sand. This brownish red (5YR 3/3) layer was compact with few inclusions.

Occupational Phase 2: Colonial/Modern Fill

Stratum PII-XXX: This layer was composed of a silty clay loam with inclusions of prepared clay (10YR 5/4) and organic carbon. The dark reddish brown (5YR 3/3; though other colors were included) matrix was semi-compact and contained <5% fine and medium-sized gravel.

Stratum PII-VIII: Silty loam containing root systems and modern trash.

Stratum PII-XXXVIII: Compact, sandy silt containing <1% clay. The brown (7.5YR 4/3) matrix contained 5-7% inclusions of angular stones measuring 2-4 cm.

Occupational Phase 3: Inka/Colonial Fill

Stratum PII-II: This stratum was composed of a silty clay loam that was brown (7.5YR 4/2) in color. The root-filled matrix was loosely compacted with approximately 40% inclusions of coarse gravel.

Occupational Phase 4: Collao/Inka Fill

Stratum PII-III: Composed of semi-compact silty clay loam, this layer of brown (7.5YR 5/3) contained inclusions of large pebbles, coarse gravel, and ceramic sherds. Roots were also found throughout the stratum.

Stratum PII-VII: Soft, semi-compact silty soil with inclusions (10%) of fine-sized gravel, which was concentrated in half of the stratum. The matrix was brown (7.5YR 5/3) in color.

Occupational Phase 5: Huaña

Reflecting the pattern of Unit II, the Huaña period occupation represented in Profile II consisted of three depositional levels: two activity or occupational surfaces, and one fill episode.

Activity surfaces:

Stratum PII-IV: Compact, brown (7.5YR 4/3) silty clay loam containing inclusions of bone and <5% sub-round gravel.

Lot PII-1: Lot PII-1 refers to an area within Stratum PII-IV exhibiting high densities of bone and ceramic materials. The soil of this area was composed of loosely compacted, brown (7.5YR 4/3) sandy soil that contained approximately 15% gravel of various sizes.

Stratum PII-XI: Compact, brown (7.5YR 4/3) clayey soil. This matrix contained root systems and medium-sized fragments of ceramics.

Stratum PII-IX: Reddish brown (5YR 4/3) clayey soil containing fine sand and modern amounts of silt. The matrix was compact and contained fragments of bone and <5% sub-round gravel.

Stratum PII-V: Compact layer of olive brown (2.5Y 4/3) silty clay loam with few notable inclusions.

Stratum PII-X: Compact, dark yellowish brown (10YR 3/4) silty loam. Medium-sized flecks of organic carbon were found scattered throughout the matrix.

Feature PII-11 (Profiles II-12, II-13): Originally excavated as Stratum PII-XLI, Feature PII-11 was a very large pit containing stratified levels of loose, friable soil mixed with gravel, burned earth, charred coprolites, carbon, and ash. As noted in the profile drawing, the letters assigned to the strata within the pit (A-G) designate differing concentrations of these inclusions. The general matrix of the pit interior was dark brown (10YR 3/3) in color; the pieces of burned clay were yellowish red (5YR 5/6) in color. The cultural materials identified among the pit's contents included large quantities of burned ceramic sherds and charred faunal remains. A fragment of a *tazon* (TA-5187), decorated with Qaluyu-style slip and incision, as well as early Pukara diagnostic sherds, were also discovered in the pit. Unlike the other pit features discovered during the excavation of Area A, this pit was extremely large, reaching 162 cm in depth and measuring 310 cm in diameter (east-west). Together with its high degree of internal stratification and cultural associations, this evidence suggests that the pit may have been used for the collective disposal of domestic trash or, perhaps more likely, refuse from a communal oven or hearth. The position of the feature on the margin of the domestic occupation is consistent with the location of modern communal dumps, which are often placed along the fringes of the community. Two radiocarbon assays (TA-5199 and TA-5200) from the bottom of the pit yielded calendar ages of approximately AD 345-450, placing the feature firmly in the Huaña period.



Figure 6.20. Feature PII-11

Fill:

Stratum PII-VI: Compact, brown (7.5YR 4/3) silty clay loam with inclusions of fine sand and <5% sub-round gravel.

Stratum PII-XII: Compact, fine, silty soil that was brown (7.5YR 5/2). This layer contained <5% inclusions of stone and ceramic sherds.

Occupational Phase 7: Formative Phase 2

No evidence of the Formative Phase 3 occupation identified in Unit II and in Profile I was encountered during the cleaning of Profile II. The Formative Phase 2 occupation consisted of

two depositional levels associated with two examples of stone architecture, one of which likely served for storage purposes.

Stratum PII-XIII: A semi-compact layer of brown (7.5YR 3/3) silty loam.

Stratum PII-XIV: A loosely compacted layer composed of silty clay loam. This layer contained various colors, creating a mottled appearance, but the general matrix was brown (7.5YR 4/2) in color. This stratum contained approximately 50% inclusions of fine-grained gravel.

Stratum PII-XXI: Semicompact layer composed of brown (7.5YR 3/2) silty clay loam with 30% inclusions of fine-sized gravel.

Stratum PII-XXXV: Clayey soil containing substantial quantities of silty as well as moderate quantities of fine sand. The brown (7.5YR 4/3) matrix was semi-compact and was composed of 50% poorly sorted gravel (fine to coarse-grained).

Stratum PII-XLVII: Varicolored (though generally 7.5YR 5/2-4/2) matrix composed of semi-compact clay loam mixed with ash and burned clay. This layer contained 10% angular and sub-angular stones measuring approximately 10 cm (on average).

Stratum PII-XV: Compact, clayey matrix containing elevated levels of silt. This soil of this stratum was brown (7.5YR 4/3) in color and contained a low concentration of large stones.

Stratum PII-XVI: Silty loam containing both fine sand and moderate concentrations of clay. The compact matrix contained fragments of bone and ceramic, large stones, and <5% medium-grained gravel. Forms of adobes, lighter in color than the surrounding matrix, were also identified in this stratum, suggesting that it may have served as the superstructure for Structure PII-9, which will be discussed in greater detail below. While the matrix was generally brown (7.5YR 4/3) in color, the stratum actually contained a series of sub-strata, which were distinguished from one another by their color and contained elevated concentrations of clay. Each of these sub-strata was assigned a number or letter designation. Letters were assigned to larger sub-strata, while numbers were reserved for the smaller, more delicate layers. As noted in the drawing of Profile II-3, several of these sub-strata were separated from one another by thin lenses of ash. The colors and principal components (if different from the general matrix of Stratum PII-XVI) of each sub-stratum are listed below:

Profile II-3:

- A:** 7.5YR 4/2
- 1:** Clay; 10YR 5/4
- 2:** Sand; 7.5YR 4/3
- 3:** Clay; 7.5YR 2.5/2
- 4:** Clay; 5YR 4/4
- 5:** Clay; 7.5YR 2.5/2
- 6:** Sand; 7.5YR 4/3
- 7:** Clay; 5YR 5/4
- 8:** Clay; 5YR 4/4
- 9:** Clay; 5YR 6/3

10: Clay; 7.5YR 5/4

11: Clay; 10YR 5/4

Profile II-4:

A: Clay; 5YR 4/3

B: Clay; 5YR 4/4, with inclusions of medium-grained gravel.

C: Clayey with areas exhibiting increased levels of silt and with very few inclusions; 7.5YR 4/4.

D: Clay; 10YR 3/4

E: Clay; 10YR 3/3

F: Clay; 7.5YR 3/3; varicolored matrix, with orange and black as dominant colors.

G: Clay; 7.5YR 3/2

H: Clay; 5YR 3/3

I: Clayey matrix with decreased amounts of silt, and inclusions of organic carbon; 5YR 3/3.

J: Fine sand with components of silt and clay; 7.5YR 3/2.

K: Clay; 5YR 3/3 (though some areas were more gray). The matrix contained 20% fine-grained gravel and flecks of carbon.

L: Clayey matrix including high levels of very fine sand and some silt; 10YR 4/3.

M: Clay; 5YR 3/3

N: Clay with 20% fine-grained gravel; 10YR 4/4.

Structure PII-9 (Profile II-3): This stone architectural feature was identified at an elevation of 212 cm below Datum 2, and measured 108 cm (north-south) x 244 cm (east-west). This structure was composed of irregularly sized (10-40 cm), sub-angular cut stone blocks, which formed two rectangular rooms (Figure 6.21). Importantly, the building materials were very similar to those of the Phase 2 constructions identified during the excavation of Units I and II. Excavation of the floors¹³ of Structure PII-9 yielded fragments of pottery, animal bone—including bird bones—and lithics—including obsidian—as well as dispersed flecks of carbon. Notably, the western room (Lot 4) contained relatively greater concentrations of carbon and ash than the eastern room (Lot 3). The structure was associated with Qaluyu and Pukara-style pottery, suggesting that its use dates to the late Middle or early Upper Formative Periods. Unfortunately, the northernmost portion of this feature had been disturbed by modern agricultural activity.

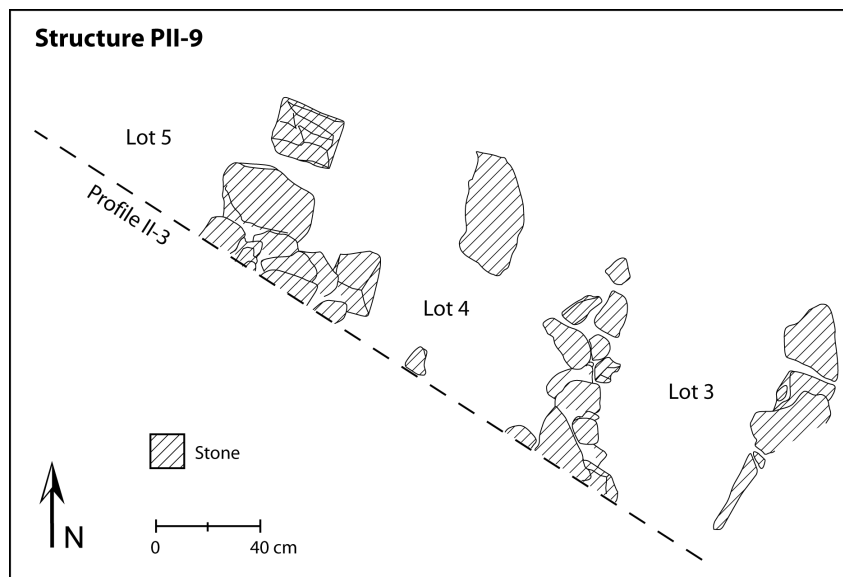


Figure 6.21. Structure PII-9. Possible storage bins associated with Phase 2 occupation

¹³ The floors of Structure PII-9 were excavated to a depth of 5 cm. The floor of the eastern room was excavated as Lot 3 and corresponds with Stratum PII-XVII; the floor of the western room was excavated as Lot 4. The floor surface to the west of Structure PII-9 was excavated as Lot 5. The soil removed during the cleaning of the structure was termed Lot 2; materials recovered from this soil, including a fragment of pottery with Qaluyu-style wide line incision (TA-5118), reflect this designation.

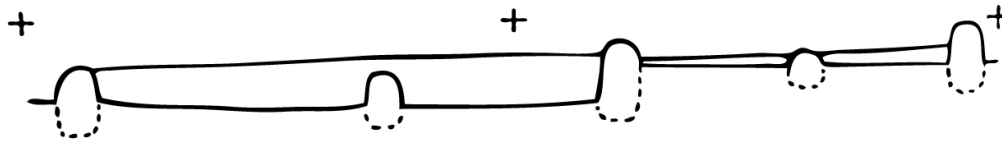
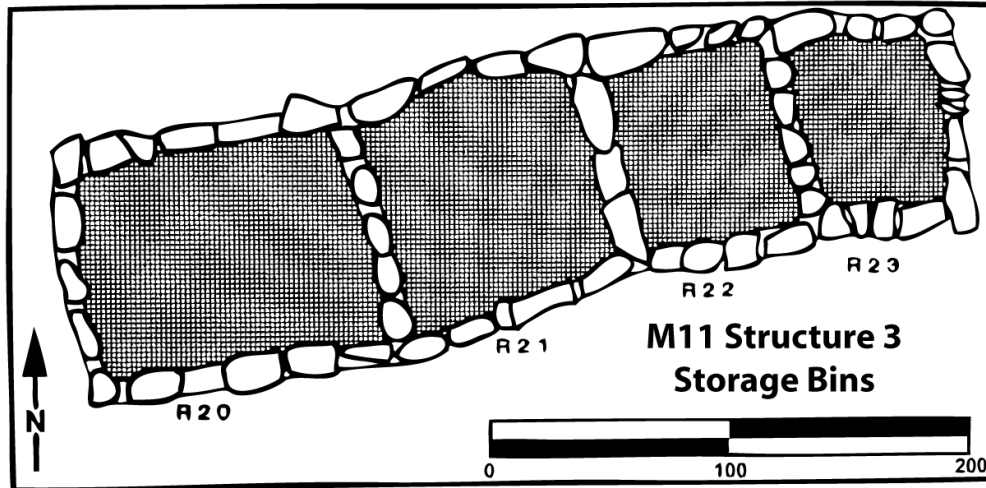


Figure 6.22. Contiguous rectangular bins used for above ground storage at Omo M11. (Redrawn from Goldstein 2005:Figure 6.22)

Structure PII-9 bears formal similarity to the above ground storage bins documented by Goldstein at the Tumilaca Phase site of Omo M11 in Moquegua (Figure 6.22). He describes these architectural as “sets of two or three continuous rectangular bins with substantial stone foundations and mud-plastered walls and floors” (Goldstein 2005:231). The foundations, floors, and roofs of these rooms had been carefully prepared and sealed with mud. Remains of camelid paws, beans, gourds, maize, and fruit indicate that these bins had been used for “the long-term bulk storage of produce for the individual household unit” (Goldstein 2005:232). In the Titicaca region, bins have been identified among the Upper Houses of Chiripa, however there is some debate whether these were used for bulk storage of dried grains and tubers (Bennett 1936; Chávez 1988) or instead served a ritual purpose, housing the mummy bundles of revered ancestors (Hastorf 2003). Lining the interior of the Upper Houses, these features deviate

significantly from the standalone structures found at Taraco. While the occupation of Area A certainly predates the construction of the bins at Omo M11, the evidence suggests that Structure PII-9 served a similar function, storing items for domestic use that were not of immediate importance.

Stratum PII-XVII: Very compact brown (7.5YR 4/3) clay loam containing dispersed stone inclusions. This stratum is the floor level associated with the eastern room of Structure PII-9.

Stratum PII-XVIII: Very compact brown (10YR 4/4 - 4/6) clay loam containing low quantities of fine sand and few identifiable inclusions. This stratum corresponds with the exterior floor surface located to the west of Structure PII-9.

Stratum PII-XIX: Reddish brown (5YR 3/3) clay loam; likely a floor or activity level.

Stratum PII-XX: Very similar to Stratum PII-XIX but containing a higher density of ash.

Stratum PII-XXII: Semi-compact, silty clay loam with 30% inclusions of fine gravel. The general matrix was brown (7.5YR 3/2) in color.

A (Profile II-8): A lens of ash mixed with silt (7.5YR 4/2)

B (Profile II-8): Dark brown (7.5YR 3/2), loosely compacted silty loam mixed with ash. This matrix contained whitish inclusions and orange-colored (7.5YR 4/4) bits of clay in a density of 50%.

Stratum PII-XXIII: Compact silty loam containing 15% inclusions of fine gravel. The general matrix was dark reddish brown (5YR 2.5/2) in color.

Stratum PII-XXIV: Silty clay loam with 10% inclusions of fine-grained gravel and stones. The matrix was compact and brown (7.5YR 3/3) in color.

Stratum PII-XXV: Semi-compact, brown (10YR 3/4) silty clay loam containing <5% inclusions of prepared clay, which were identified by their distinct color (10YR 4/6).

Stratum PII-XXVI: Dark brown (7.5YR 3/2), semi-compact silty clay loam with <5% gravel inclusions.

Stratum PII-XXVII: Silty clay loam containing fine and medium-grained gravel (approximately 15%). The matrix was dark brown (7.5YR 3/2) and semi-compact.

Stratum PII-XXVIII: Semi-compact, very silty clay loam. The general matrix was dark reddish brown (5YR 3/2), the stratum contained inclusions of clay that were distinguished by their lighter hues (5YR 4/3).

Stratum PII-XXIX: Dark reddish brown (5YR 3/2), semi-compact, silty soil matrix containing <5% inclusions of yellowish red (5YR 4/6) burned clay.

Stratum PII-XXXI: Compact clayey soil containing both silt and fine sand. The dark brown (7.5YR 3/2) matrix contained inclusions of yellowish red (5YR 5/6) clay.

Stratum PII-XXXII: Yellowish stratum composed of dark brown (7.5YR 3/2) silty clay loam. The semi-compact matrix contained approximately 50% yellowish (10YR 4/4) inclusions, as well as 5-10% medium and coarse-grained gravel.

Stratum PII-XXXIII: Mottled pink (7.5YR 3/3) layer composed of semi-compact clayey soil mixed with some silt. Very few inclusions were identified in this stratum.

Stratum PII-XXXIV: Very similar to Stratum PII-XXXIII, but distinguished by its color; pinkish stratum (5YR 3/4) composed of clay with some silt. The matrix was compact and contained no identifiable inclusions.

Stratum PII-XXXVI: This stratum was much darker than the surrounding matrix of Stratum PII-XXII. It was composed of a semi-compact dark brown (7.5YR 3/2) silty loam that contained moderate levels of fine sand and 5% medium-grained gravel.

Stratum PII-XXXVII: Silty loam containing very few inclusions. The matrix was more compact than Stratum PII-XXXVI, and was brown (7.5YR 4/2) in color.

Stratum PII-XXXIX: Loosely compacted, fairly homogenous fine silt. The matrix contained low concentrations of sand and was brown (7.5YR 5/3) in color. This stratum was likely part of the superstructure associated with Structure PII-10.

Structure PII-10 (Profile II-12): This architectural feature was a stone foundation that was situated at an elevation of 160 cm below Datum 2. Measuring 92 cm from east to west, it was composed of unworked stones of variable shape and size. The soil immediately above these stones (Stratum PII-XXXIX) appeared to be degraded adobe that once served as the superstructure. A thin lens of ash was visible immediately underneath the stones on the eastern side of the wall.

Stratum PII-XL: Semi-compact, brown (7.5YR 5/2) matrix containing components of both silt and sand.

Stratum PII-XLV: This area of soil exhibited very high concentrations of ash and contained dispersed flecks of carbon. The matrix was very loose and was grayish (7.5YR 5/2-5/1) in color.

Occupational Phase 8: Formative Phase 1

Stratum PII-XLII: This stratum was associated with the only example of Formative Phase 1 architecture discovered during the cleaning of Profile II, and represents part of the earliest occupation of Area A. Stratum PII-XLII was a fairly homogenous layer of brown (10YR 4/3) that contained dispersed patches of reddish (5YR 4/4) clay inclusions.

Structure PII-11¹⁴ (Profile II-12): Situated at 122 cm below Datum 2, this architectural feature consisted of a large group of stones, which were probably wall-fall. Bits of burned clay were

¹⁴ In the original profile drawing, this structure was labeled as part of Feature PII-10, which has since been eliminated.

discovered between the wall stones. Unfortunately, due to the deterioration of the structure, river activity, and the limited visibility granted by the profile, it was not possible to determine neither the form nor the function of this building. Nevertheless, given the abundance of visible wall stones (Figure 6.23), it is reasonable to speculate that the feature was a fairly large structure.



Figure 6.23. Structure PII-11, as seen from the top of Profile II-12.

Sterile

The following strata contained were determined to be culturally sterile, containing no material associations.

Stratum PII-XLVI: Compact sandy clay with <1% small (approximately 1 cm) whitish inclusions. 7.5YR 4/4.

Stratum PII-XLIII: This layer was composed of a series of sandy matrices, and is likely a product of river activity. The designations A-D indicate different types/amounts of gravel inclusions and/or colors.

- A:** Semi-compact, medium-grained sand. 5YR 5/3.
- B:** Very compact, poorly sorted matrix composed of coarse, medium, and fine-grained sand. 5YR 6/2.
- C:** Poorly sorted, friable matrix composed of 40% gravel (fine and medium-sized) sub-round pebbles (1-2 cm). 7.5YR 5/3.
- D:** Very loose medium-grained sand with 10% inclusions of fine and medium-sized gravel. 7.5YR 5/3.

Stratum PII-XLVIII: Compact matrix consisting of medium-grained sand mixed with some clay. Inclusions of organic charcoal were found dispersed throughout the matrix, but in very low concentrations. 7.5YR 5/3.

Stratum PII-XLIX: Very compact, fairly homogenous fine clay; very similar in composition to PII-XLIV, but distinct due to its color (2.5YR 5/3).

Stratum PII-L: Compact clay with 15% gravel and <1% inorganic black inclusions. 7.5YR 4/4.

Stratum PII-LII: Very compact, very fine, yellowish (10YR 6/4) clay.

Stratum PII-XLIV: Very compact sandy clay. 5YR 4/4.

CHAPTER 7: MONITORING DOMESTIC PRACTICE

7.1 Introduction

The excavations of the deep cultural deposits at Taraco produced a tremendous volume of materials. This chapter presents the results of the analysis of the ceramics excavated from the high-status residences of Area A, and monitors various patterns in the domestic assemblage through time. As discussed in Chapter 5, pottery figured into multiple components of both exclusive and inclusive elite strategies. Forms such as trumpets and incense burners served vital roles in the rituals and ceremonies in which elites displayed and competed for status. Perhaps more importantly, pottery is inexorably linked to the everyday processes of food preparation, consumption, and sharing. While certainly mundane, these are nevertheless social activities that are vital for extending alliances and maintaining factions. For these reasons, the study of pottery found in domestic contexts is an ideal way to examine the development of this aspiring center.

7.2 Formative ceramics: special considerations

During the Formative Period, the production of ceramics—including everyday and special purpose wares—was largely a local enterprise. Based on evidence from around the Titicaca area, as well as his own research, Roddick argues that the components of Late Formative pottery production—clay acquisition, paste preparation, vessel construction, finishing, and firing—were not part of a formalized industry of specialized artisans. Rather, the manufacture of ceramics was likely a component of the domestic sphere, an activity that was “spread across the landscape as the past of a larger taskscape, embedded in broader practice” (Roddick 2009:209-210). Data from the site of Kala Uyuni suggests that the manufacture of pottery did not take place in specialized facilities. Rather, tamped surfaces adjacent to the Late Formative buildings likely served as the loci for pottery forming and finishing. Though the nature of these “external occupation zones” (Roddick 2009:210) is not completely understood, much about these activity surfaces suggests their involvement in pottery manufacture. They are located close to domestic spaces, and fairly close to water sources, which are necessary for paste production and vessel formation. Although these surfaces appear to have been swept clean, their excavation yielded evidence of bone and lithic tools that were likely used in production. Ceramic tools, such as modified sherds used for smoothing coil-built pots, were also found.

Studies of Formative ceramics in the Titicaca area have used a variety of systems for the description, quantification, and categorization of paste types. However, these typological categories are not foolproof. Roddick, who worked closely with Lee Steadman while completing his dissertation research, noted issues with replicability of paste analysis, going so far to say that, “nothing could substitute actually working with Steadman,” (Roddick 2009:205) who developed the system of analysis. He suggests that it is not a problem with her system, per se, but rather

with the nature of the material and the assemblages. Bandy, who also utilized Steadman's typology, shared this sentiment: "it is very difficult to learn to distinguish the various paste groups as I have described them here. They really cannot be conveyed satisfactorily in writing" (Bandy 2001:56).

Are the problems with Formative ceramics really the fault of the assemblage? The answer is both yes and no. I argue that, as with many issues, it is an issue of scale. Formative ceramics are so variable, and the differences between some paste types so subtle, that I have encountered what appear to be two distinct paste types in the same sherd. Working with small samples, heterogeneity of paste may not be an issue—on the contrary, in small samples such variability may even be desirable, as it presents an opportunity to examine the work of individual artisans working within a shared system, referred to by some scholars as a "community of practice" (Roddick 2009). It is this variability, however, that poses a problem for bulk analysis. If too many attributes are collected at a very fine scale, the data become overwhelming and the general patterns of a large assemblage become more difficult to discern. It literally becomes a problem of "too many types" (Feinman and Neitzel 1984).

For this reason, analysis of the Taraco materials was carried out using a typology of form and paste that was first developed by Cecilia Chávez in her analysis of the ceramics from survey in the Huancané-Putina region (Chávez 2008a). Chávez and colleague's subsequent analysis of materials from excavations at Pukara (Klarich 2005) as well as survey in the Taraco-Arapa region (Stanish and Umire 2004) has resulted in some modification and expansion of the typological categories. The organization of the typology and its application are described in detail below, but simply stated, this system of functional classification employs a series of hierarchical categorizations, rather than attributes, to break down unwieldy assemblages into

manageable groups that are suitable for analysis. For the analysis of ceramic pastes, the system has the distinct advantage of identifying similarities and differences at various scales of analysis, helping to alleviate the significant issue that was noted above. However, despite the numerous advantages of Chávez's typology, my own experience with paste analysis was similar to Roddick's, in that I found that there really is no substitute for actually working with the creator of any typology, and I was very fortunate to be able to work closely with Chávez and her assistants throughout the duration of the pottery analysis.

7.3 Results from the Huancané-Putina survey: a new approach to ceramic analysis

Chávez's analysis of materials from survey of the Huancané-Putina region presents a new, alternative framework for the study of ceramic artifacts in the *altiplano*. Her classificatory system effectively revises many of the longstanding assumptions regarding form, technology, and style that have structured many of the previous studies of ceramic analysis. The following method of analysis is adapted from her report.

Chávez's system combines four criteria and levels of analysis for the effective study of large samples of ceramic artifacts, and makes an effort to avoid some of the biases of the traditional seriation and/or typology-based approaches. The first of these criteria considers the raw material, and represents the first level of analysis by which groups of sherds could be formed. Operating under the assumption that different colors correspond with different sources of raw material, she differentiated the groups from one another by their color.¹⁵ The second criterion considers the technology of ceramic manufacture, and refers to characteristics of production as manifested in the paste, firing, and surface treatment. Together, these

¹⁵ This assumption was challenged by the results of the LA-ICP analysis.

technological attributes constitute an *alfar*. The third criterion is sherd morphology, which allows for the classification of vessels according to form and function. Surface decoration is the fourth attribute by which ceramics were clustered, and is the final aspect considered in this general schema. Of particular interest to the present study are the second and third criteria, the classification of technological and morphological characteristics. Analysis of these features permits monitoring of the activity patterns associated with the household economy, and, as such, provides important information about subsistence and production.

The analysis of technological characteristics consisted of a three-stage process: 1) the identification of individual paste types, 2) the creation of paste groups, and, ultimately, 3) the definition of the *alfares*. The completion of this process yielded a hierarchical classification scheme that permits understanding of the relationships among the various pastes; depending on the scale of the analysis, a host of similarities and differences can be observed. For the materials from the Huancané-Putina survey, the first stage of this procedure—the identification of paste types—began with the separation of sherds by clay group, as defined by the color of the clay matrix (raw material). The next stage involved the identification of the different types of non-plastic inclusions that were used in each of the groups. The specimens in the Huancané-Putina sample were found to contain a combination of natural tempers, such as sand and quartz grains, and non-plastic additives, including mica and lithic fragments. Based on the size, shape, abundance, and combination of these inclusions, Chávez identified 128 unique paste types for this assemblage.

Once paste types had been identified, they were clustered into paste groups. Paste groups consolidate unique paste types exhibiting similar non-plastic inclusions and matrix colors. While this step may at first seem superfluous, in practice, paste groups are extremely useful for ceramic

classification. Chávez argues that similar usage of primary inclusions is a probable index of shared raw material sources; variations likely suggest particularities related to specific traditions of ceramic production. Paste groups were labeled with both Roman and Arabic numerals. The Roman numeral refers to the paste group; within these categories, the Arabic numeral serves to index the cultural period, representing the number of variants or subdivisions present in that paste group for the given cultural period¹⁶. The use of these paste groups not only aids in identifying relationships among the myriad paste types, but also helps to streamline ceramic analysis, by examining paste attributes at a more general scale than the paste types alone.

The final stage in the technological analysis was the definition of the *alfares*. This involved the analysis of the overall quality of the paste, and considered such features as the compaction, durability, and the texture. For each cultural period, paste groups were clustered together based on similarity of their technological characteristics, forming what Chávez refers to as *Alfares Tecnológicos*. These were each assigned Roman numeral designations. Ceramics of the Formative period were divided into three *alfares* (I, II, and III), whereas Huaña was found to contain only two *alfares* (I and II).

Analysis of the morphological characteristics (form) was carried out in a similar fashion, and likewise resulted in a tiered system of classification. Unlike the technological analysis, however, classification of vessel form proceeded from the most general categories to the most specific. The most general category, vessel class, refers not only to the morphological features of a specimen, but also to its function. Chávez states that there exists an inexorable link between form and function, and that this relationship is manifest in the shape of the vessel. She argues that the shape of a vessel cannot be considered random because a ceramic assemblage must

¹⁶ Affiliation with a cultural group was determined by surface treatment and decoration, as well as stratigraphic information, when available.

respond to a host of specific daily needs. Such everyday vessel use might include the preparation of foodstuffs (cooking, processing, and fermenting) and food consumption (eating and drinking), along with the storage and/or transport of foodstuff and other goods. This line of reasoning—as well as recognition of the relationship between form and function—is not new (see discussion in Rice 1987:209), but is often overlooked due to the persistence of generic terminologies (familiar terms such as jar and bowl), as well as regional terms for vessel shape (e.g., aryballus, tecomate, pithos, and so forth), and local typologies.

Chávez uses these functional categories to define a series of vessel categories (see Appendix D for a complete list of vessel categories and their variants) that together comprise two general classes of vessel form: open and closed. Open vessels are unrestricted forms—those for which the diameter of the orifice is equal to or larger than the maximum diameter (Rice 1987:212; Steadman 1995:56).¹⁷ These forms are generally associated with the serving and consumption of solid foods and liquids. This category includes four principal types. *Tazones* are bowls with direct walls that may be slightly flared. Their depths are proportionally greater than half the diameter of the vessel mouth. *Cuencos* are a second bowl form; these have convex walls and approach hemispherical in their shape. Their depths are proportionally less than half the diameter of the vessel mouth. *Platos* (plates) also have convex walls, but are much shallower than *cuencos*; their depths are generally less than one-third of the mouth diameter. Concave-walled *tazas* (cups), the fourth type of open vessels, have depths that are roughly equal to half of their mouth diameter, and have a handle. For open vessel forms there are five possible variants,

¹⁷ This definition is taken from Rice 1987. Chávez actually defines open vessels as those whose mouth diameters are equal to or greater than the vessel height. Although, in practice, they refer to the same class of artifacts, Rice's definition is more widely accepted and will be used here.

types A-E,¹⁸ which classify sherds within form categories based on the contour of the wall and the shape of lip. Numbered sub-variants serve to further divide sherds within classes of variants.

Within the class of closed vessels there are five form categories. Closed vessels are restricted forms with orifice diameters that are smaller than the maximum diameter. Closed vessels, as will be discussed later, are associated with food preparation, as well as the storage of liquids and solids. For each of the closed forms, the depth of the vessel is proportionally greater than half the orifice diameter. *Jarras* are small to medium-sized jars (orifice diameter < 17 cm) with wide mouths and necks, tapered bases, and flaring (concave) rims. When handles are present (one or two), one end attaches to the body and the other is joined with the vessel lip. *Cantaros* are large vessels (orifice diameter > 17 cm) with narrow mouths, wide bodies, and tapered bases, flaring (concave) rims, and often one or two handles. Both *jarras* and *cantaros* are considered storage forms. *Ollas* are large cooking vessels with wide necks and mouths. They have wide bodies, tapered bases, and flaring (concave) rims. One or two handles attaching to the middle of the vessel body are common. *Botellas* are small to medium-sized forms with narrow necks and mouths offset by wide bodies and tapered bases. They have flaring (concave) rims and may exhibit one or two handles. *Vasos*, the final closed form, are long and cylindrical in shape, but may have concave walls. As with the open categories, there are five lettered variants (and several numbered sub-variants) for the closed forms that further classify specimens by their wall contours and lip shapes. Not all of these variants are present for each of the form categories, however.

This functional typology also allows for the inclusion of special variants that are specific to certain cultural traditions. In this framework, such forms as Inka aryballos, and Tiwanaku *keros*, and Pukara *incensarios* (braziers) are special versions of the typical forms included in the

¹⁸ These five variants are not represented for all open vessel forms.

typology.¹⁹ *Keros*, for example, are *vasos* used during rituals and ceremonies, while an *incensario*²⁰ is a pedestal-based *cuenco* or *tazon*. *Incensarios*, even when fragmented, can often be distinguished by their highly decorated exteriors and internal evidence of combustion. In addition to the forms included in this functional typology, some additional “special” forms were identified in the Huancané-Putina assemblage. These include trumpets, miniature vessels, *adornos*, and ceramic tools, such as *ruecas* (spindle whorls) and *pulidores* (polishers). Although they do not fall into any of the functional categories employed in the typology, these extremely important forms were analyzed (retaining their designation) and included together in an “other” category for data management purposes.

Given the close geographical proximity of Taraco to the Huancané-Putina survey area, the resultant typology is appropriate for use with the present sample. The application of this typology to the materials from Taraco represents an important test of the Chávez’s system, which has been formulated through the analysis of data obtained through surface collection. Using this new typology to analyze the materials recovered from stratigraphic excavations also allow for the verification and refinement of Chávez’s conclusions, and will demonstrate its usefulness for future studies. Of course, the typology was expanded and/or modified when necessary; in fact, several new paste types—as well as a handful of paste groups—were identified during the analysis of the Taraco materials. New paste types were characterized and incorporated into the typology using the methods outlined above. Moreover, the stratigraphic component of the analysis resulted in the reorganization of some types within and across temporal categories.

¹⁹ During the analysis of the Taraco ceramics, these special form designations (i.e. *incensario*, *kero*, etc.) were used alongside the label from the formal typology in order to facilitate the identification of ritual and other special purpose objects in the assemblage.

²⁰ *Incensarios* were labeled as such in the analysis of the Huancané-Putina materials.

7.4 Bulk Ceramic Analysis

In accordance with standard laboratory procedures, all ceramic artifacts excavated during the 2006 and 2007 field seasons were washed, counted, weighed, sorted into diagnostic and non-diagnostic specimens, and recorded in the project inventory. These activities took place on a weekly basis during the course of the field season. However, due to the high volume of ceramics recovered from the Area A excavations, only pottery from selected contexts were analyzed with respect to paste and form. This second phase of analysis took place over the course of the 2008 laboratory season. All of the diagnostic sherds recovered from Unit II were analyzed, as the unit yielded a relatively complete occupational sequence and had been carefully excavated following natural stratigraphic changes. As it was possible to determine the continuation of Unit II's architecture, stratigraphic layers, and depositional events into the adjacently located Unit I, excavated by Stanish and de la Vega in 2004, materials from this unit were also analyzed (see Appendix B for the correspondence of excavated levels between Units I and II). The close relationship between these two units allowed Unit I's materials to be assigned to the occupational phases defined in Unit II, though undoubtedly, some resolution in these data was blurred because these units were not excavated simultaneously. Nevertheless, the ability to include materials from Unit I in the ceramic analysis was extremely fortunate, as it increased the sample size for the earliest levels. Selected sherds associated with the architecture uncovered during the cleaning of Profiles I and II were also analyzed, as were examples of finewares, including fragments of trumpets and finely decorated *tazones* and *incensarios*. This latter category of sherds, which could only be assigned to the Formative occupation in general (and not any of the specific Formative occupational phases), were considered much like materials from surface collection, indexing the types of activities that once took place at the site.

In total, 7480 diagnostic sherds were analyzed; based on stratigraphy, 1466 of these were determined to date to the Formative Period. Of these Formative sherds, 1418 could be assigned to one of the three Formative occupational phases, allowing for the tracking of both domestic and ritual activity patterns over time. The general assemblage was found to be incredibly diverse, and included domestic wares, such as *ollas*, storage jars, and undecorated bowls, in addition to finely painted and incised trumpets and *incensarios*, as well as elaborate serving-ceremonial wares. In the following section describes the results of the form and paste analysis. As the focus of this study is the Formative Period, only these results are reported in detail here.

7.4.1 Analysis of form: results

The results of the formal analysis of Formative ceramics are presented in tabular form in Appendix E; this table includes the distribution and relative abundances of vessel variants by Formative occupational phase. Illustrations of selected analyzed sherds are presented in Appendix G. Prior to analysis, sherds determined to be part of the same vessel were glued together, and the total sherd count was adjusted accordingly. For the analysis of form, rim sherds were first divided into “open” (unrestricted) and “closed” (restricted) categories. From that point, they could be assigned into one of the form categories defined by Chávez (i.e., *ollas*, *cuencos*, *tazones*, etc.). Sherds were then further classified into the various sub-categories of each form type. For example, an unrestricted bowl with a direct wall angle would be classified as a *tazon* (as opposed to a *cuenco*, which has convex walls); a secondary “B8” designation would be assigned to a rim sherd with an interior bevel and a thickened exterior lip. Bases and decorated body sherds were assigned to either “open” or “closed” categories. These data were

recorded in notebooks and then transferred to a FileMaker Pro database. Rim sherds were drawn and information for vessel diameter, color, and decoration were recorded on these drawings.

7.4.1.1 Formative Phase 1

Dating to the early part of the Middle Formative (ca. 1260-1055 cal BC), Formative Phase 1 was the earliest cultural context excavated at Area A. Even with the inclusion of the materials from Unit I, the total sample of diagnostic sherds recovered from secure Formative Phase 1 contexts was quite small (N = 53). Of these sherds, it was possible to determine a vessel form for 30 specimens—the remaining 23 sherds were either bases or handles, for which a specific form could not be determined, or were too eroded to securely designate a form. The assemblage was dominated by cooking vessels (*ollas*), which comprised 77% of the total sample. These Phase 1 *ollas* were quite variable in size, with diameters that range from 12-32 cm (mean = 22.06 cm). While nine of Chávez's *olla* variants were represented in the sample, the overwhelming majority (70%) of *ollas* were of the neckless or short-necked variety (types D and E), a pattern that is consistent with other studies of Qaluyu ceramics from around the region (Plourde 2006; Steadman 1995 etc). Serving wares (N = 6) composed 20% of the sample, and significantly, only straight-walled *tazones* were represented. These *tazones* were quite large, with a mean diameter of 28.4 cm (when one outlier measuring 16 cm is excluded from the calculation, that value increases to 31.5 cm). All of these *tazones* were assigned to the type B sub-category, and three of them (50% of the sample) were decorated in some way, either with slip or incision. Variants belonging to the B group all have a thickened exterior rim, resulting in a lip along outer edge of the vessel orifice. Only a single jar sherd (diameter = 15 cm) was recovered from secure Phase 1 excavation contexts.

7.4.1.2 Formative Phase 2

Dating to the early part of the Upper Formative, the sample of ceramic artifacts from Phase 2 of the Formative occupation of Area A was larger and more diverse than the underlying Phase 1 assemblage (N = 236). Of this total sample, it was possible to determine a vessel type for 119 fragments. In a significant shift from the distribution of the Phase 1 ceramic forms, the majority (51%) of the ceramics recovered from Phase 2 contexts were serving vessels, while only 31% were designated as cooking vessels. The serving assemblage was composed of both *cuencos* (N = 24) and *tazones* (N = 37), and included 22 of Chávez's sub-types. *Cuencos* were relatively evenly distributed across 10 sub-variants, and ranged from 8-29 cm in diameter (mean = 17.26 cm). Among the *tazones*, however, certain variants were far more ubiquitous than others—sub-types A5 (flat), B1 (rounded, exterior lip), B4 (rounded, thickened exterior lip), and B5²¹ (exterior bevel) were the most common of the 12 variants identified, and together, they constituted 65% of the sample. It is also notable that the majority of the Phase 2 *tazones* were assigned to type B (68%), continuing the trend of the Phase 1 assemblage. On average, the *tazones* were larger than the *cuencos*, ranging from 12-33 cm in diameter (mean = 21.43 cm).

The serving assemblage contained both decorated and undecorated specimens, but the sample was dominated by sherds that were embellished in some way. A staggering 69% of all Phase 2 serving vessels were decorated, and relatively equal proportions of the *tazones* and the *cuencos* were decorated, despite differences in the size of their respective samples. By far, the most prevalent decorative technique was the pre-firing application of allover slip, which was often burnished to a brilliant sheen. A number of bowls (N = 9) exhibited incised designs, and among these, both Qaluyu and Pukara-style motifs were represented.

²¹ *Tazon* B5 was the most common variant in the entire serving assemblage (N = 10), representing nearly one-third of all *tazones* and making up 16% of the total sample of serving wares.

For *ollas*, the sample (N = 37) consisted of necked vessels with both direct (straight) and concave (flaring) rims, as well as short-necked and neckless variants. Again, the latter two categories (*olla* types D and E) were the most common (62%) forms of cooking vessels represented in the Phase 2 sample. Their diameters were quite variable, ranging from 7-40 cm in size (mean = 19.32 cm). A notable percentage (24%) of cooking pots were decorated, although any surface alteration to these vessels was generally restricted to dark red or red-brown Qaluyu-style slip; such exterior surface treatment may have been used to decrease vessel permeability (Schiffer 1990; Steadman 1995). No painted, incised, or modeled embellishments were noted for the Phase 2 *ollas*. While only 12% of the Phase 2 ceramic assemblage was composed of storage vessels, this frequency is a marked increase from the prior occupational phase. This sample included only small storage containers (*jarras*), with a mean diameter of 11.25 cm. Half of the jars in the assemblage were decorated with red slip, and had been very highly burnished. Two lids, likely used during cooking activities or perhaps for the protection of stored goods, were also identified.

The sample of pottery recovered from Phase 2 contexts also included ceramic tools, as well as several non-utilitarian forms. Tools found in the assemblage included a ceramic *pulidor* (polisher; TA-1957-04) and a spindle whorl (TA-1290-1-01). Curiously, the *pulidor* was charred on one side. The Phase 2 contexts also yielded the earliest evidence of ceramic ritual paraphernalia. The non-domestic component of the Phase 2 assemblage included a single incised trumpet fragment (TA-1358-01), as well as two *incensario* sherds (TA-1965-01 and TA-1986-01). Both *incensario* sherds contained evidence of sooting on their interiors, indicating an association with burning organic material. TA-1986-01, a highly eroded, polychrome incised hollow feline face, bears many formal similarities to those adorning braziers from the site of

Pukara, though it is of much poorer quality (Figure 7.1). The other *incensario* fragment exhibited all-over red slip and wide, shallow incisions forming an angular geometric design. Though only three sherds were found, these artifacts nevertheless provide confirmation that residents of Area A were in fact participating in the types of religious activities—Yaya-Mama or otherwise—that were shared and practiced by other communities across the northern Basin at this time.



Figure 7.1. Phase 2 *incensario* (TA-1986-01).

7.4.1.3 Formative Phase 3

The Formative Phase 3 ceramic assemblage, dating to around the first century AD, was quite large, consisting of 1110 sherds. Of this total sample, a vessel type could be assigned to 582 specimens. The bulk of sherds were relatively evenly distributed across serving, cooking, and storage categories, though cooking vessels were most common of the three (41%). Five percent of the sample belonged to the “other” category, which included ceramic tools, such as *pulidors*, and ritual paraphernalia, such as trumpets and *incensarios*.

The serving assemblage consisted of 152 vessels, the majority (61%) of which were identified as *cuencos*. While 16 variants were represented, the assemblage of *cuencos* was primarily composed of sub-types A1 (rounded rim), A5 (rounded with thickened exterior, no lip) and B1 (rounded, thickened exterior lip), which, together, constituted 70% of the sample. These range in diameter from 7-29 cm, with a mean value of 17.27 cm. Only 34% of the *cuencos* were decorated, though a greater variety of decorative techniques were identified for the Phase 3 assemblage than for the previous two occupations. This increased variety likely represents the effects of a larger sample size for Phase 2. While allover slip continued to be the most common means of surface alteration, specimens were also found adorned with paint, incision, and modeled appliques.

In the third phase of the Formative occupation, *tazones* represent only 38% of the serving assemblage. This figure represents a significant shift from the earlier two phases, in which this form was the predominant category of serving vessel. In addition to the decline in their frequency, Phases 3 *tazones* were also smaller than in the previous phases, ranging in diameter from 10-30 cm, with a mean value of 18.08 cm. In all, 12 variants were identified in the *tazon* sample, though 40% of the assemblage was made up of types A1 and B9 (wide, thickened lip). Nearly half (47%) of the sherds were decorated in some way, with allover slip again being the most common form of decoration. Several sherds (N = 6) also exhibited some type of incision, which usually formed a geometric design. A particularly extraordinary specimen, TA-1907-1, was embellished in the classic Pukara style with slip, paint, and incision. Discovered smashed on top of the floor (Feature UII-11) of Structure UII-1, this fragment of a *tazon* B9 was decorated with two zone-incised felines, which were featured in profile facing each other, along with another undetermined figure (possibly a bird; see Figure 6.9). As mentioned in Chapter 6, this

design is particularly significant, as it is repeated in a number of instances around the Taraco site area—most notably in a sizeable piece of lithic art currently on display at the Museo Lítico Taraco—and echoes the motifs of classic Pukara iconography.

In addition to the bowls, the Phase 3 serving assemblage also contained two plates. According to Chávez's study, these forms are not generally associated with Formative contexts; however, their pastes were unequivocally Formative (FIII:III-52 and FII:II-6/44), and very similar to the other sherds in the Phase 3 sample. However, it is also possible that, given the size of the specimens, compounded by the variability and poor quality control of Formative ceramics, that these two sherds were not actually "plates," as defined by Chávez, but rather very shallow bowls. After all, only a small difference in wall angle spells the difference between plates and bowls.

The sample of cooking vessels recovered from secure Formative Phase 3 contexts was fairly large, consisting of 241 vessels. These range in diameter from 8-38 cm, with a mean value of 17.53 cm. In this assemblage of *ollas* fragments, only 20% were neckless or short-necked (all variants), a pattern consistent with other studies of early Upper Formative pottery assemblages from around the northern Basin. The variant B2 (20-30° flaring rim) was the most common form of cooking vessel, making up 40% of the sample. For some perspective on this figure, variant A1 (straight, rounded rim), the second most common form of *olla* in the sample, represented only 23% of the sample. Only a small percentage (5%) of sherds in this category were decorated, and allover slip was the only decorative technique applied to Phase 3 cooking vessels. Five lids were identified in the Phase 3 sample, though it is not clear if they were associated with the cooking or the storage assemblage (or possibly both).

Relative to Phase 2, the Phase 3 assemblage exhibited a twofold increase in the abundance of storage vessels, as well as a greater variety in the types of vessels used for storage. The Phase 3 storage assemblage was composed of 161 vessels, and while the overwhelming majority (80%) of these were jars, the sample also contained *cantaros* (18%), as well as three bottle sherds. Phase 3 jars range in size from 8-17 cm (mean = 14.05 cm), and the sample was disproportionately distributed across five variants. Types A (N = 57) and B2 (N = 56) the most ubiquitous forms; together, these two variants form 88% of the sample. Only 19% of the jars were decorated, the majority with allover slip. Many of the sherds had been burnished to a brilliant sheen. It is notable that *cantaros* only appear in the Phase 3 assemblage. This category of very large (mean = 20.07 cm) jars are not terribly common (N = 29), and while their presence in Phase 3 may be a product of larger sample size, their appearance may also speak to a shift in the nature of storage related behaviors, perhaps changes in the types or the quantities of materials that were stockpiled. Ranging in diameter from 18-29 cm, these vessels have greater internal volumes than regular jars, and are therefore capable of holding much greater quantities of goods than regular jars. Ten of the *cantaros*, or 34% of the sample, were decorated, usually with slip, although two exceptional examples—one exhibiting a geometric incised design, and the other displaying painted decoration—were also identified. Bottles likewise appear for the first time in the Phase 3 storage assemblage. In her analysis of the Huancané-Putina materials, Chávez found this form category to be exceptionally rare, appearing in only certain *alfares*. Though only three of these small (mean diameter = 6 cm), long-necked vessels were identified, their presence alone is significant, and, as with the *cantaros*, suggests an expansion in the range of storage-related activities.

The Phase 3 assemblage also contained a number (N = 28, or 5% of the total sample) of artifacts that could not be assigned to the storage, cooking, or serving categories. As the Phase 3 assemblage was recovered from a secure floor context and associated architectural debris (destroyed during the burn event) over a relatively small horizontal area, these specialized artifacts help to paint a more nuanced picture of Upper Formative domestic activities than allowed for the previous occupational phases. Four ceramic *pulidors* were identified. It is notable that three of these tools were found among the refuse deposited in Feature UII-12, which was also found to contain an abundance of discarded and/or broken lithic tools, including several *azadon* (hoe) fragments, a *pulidor*, a *raspador* (scraper), and a *chancador* (crusher), as well as an abundance of flakes and debitage.

This assemblage also contained several ceramic artifacts that suggest that Phase 3 residents regularly participated in ritual and ceremonial activities, in addition to regular domestic activities, such as food preparation, cooking, and eating. Seven trumpet fragments were identified, along with eight *incensario* sherds. Three of the trumpet fragments were embellished with incised geometric designs. All of the *incensario* fragments were decorated in the Pukara-style with polychrome, zone-incised motifs; two of these also exhibited modeled decorative elements. TA-1815 was especially remarkable, having been formed in the shape of a mouth, replete with blocky, square teeth (see Figure 6.5). Four of the polychrome incised sherds appear to depict characters, or part of a scene, such as those illustrated by S. Chávez (1992) and Franquemont (1986); unfortunately, the fragmentary nature of these sherds precluded the assessment of their iconography with any further accuracy.

In addition, the non-domestic assemblage also included a ceramic feline face (TA-1229-01), much like those used to adorn the annular base bowls and *incensarios* discovered at the

monumental site of Pukara. Relative to the poorly made face found in the Phase 2 sample, TA-1229-01 was extremely well executed, manufactured from an extremely fine and fairly rare paste (FIII:I-5/22), with incised and painted design elements (Figure G.37). Though the face lacks the vertically divided eye and rayed tear bands that are so characteristic of the Pukara-style ceramic felines (found both at Pukara and surrounding sites, such as Huatacoa), the N-shaped fangs do suggest some stylistic affinity with the monumental center (Figure 7.2).



Figure 7.2. (Left) Classic Pukara style feline from Huatacoa; (right) Taraco feline (TA-1229-01).

Also notable was the discovery of a single miniature bowl (TA-1183-05), with a base that measured 7 cm across. Such miniature artifacts are fairly rare, and have been consistently regarded as special-use objects that were part of the suite of Pukara ritual vessels (Chávez 1992; Franquemont 1986; Klarich 2005; Rowe and Brandel 1969:Figure 72). Examples of miniature trumpets, jars, bowls, and tubes have been found at many locales throughout the Titicaca area (Steadman 1995), though the majority of miniature vessels have been recovered from the site of Pukara itself (Franquemont 1986). While they constitute only a small portion of the overall ceramic assemblage, Klarich's recent excavations at the site yielded at least five, highly

decorated examples of this rare vessel category (Klarich 2005:337). Importantly, out of all the diagnostic sherds analyzed from the Area A excavations, TA-1183 was the only miniature vessel identified.

7.4.1.4 Temporal Patterns of Ceramic Forms

It is significant that the distribution of the ceramic forms does not remain consistent across the three phases of the Formative occupation. The Phase 1 assemblage, though small, is dominated by cooking vessels; by Phase 2, however, serving vessels constitute the majority of the pottery sample. This trend is reversed in Phase 3, when *ollas*, once again, become the most common vessel type (Figure 7.3).

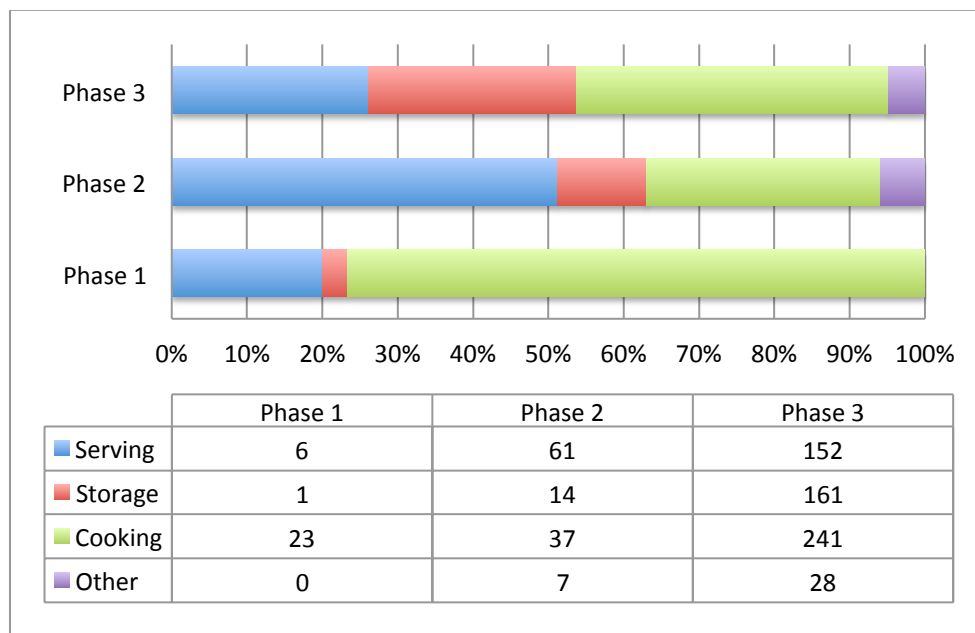


Figure 7.3. Distribution of ceramic forms by Formative occupational phase

A casual glance at the frequency distribution patterns might suggest that Phase 3 residents of Area A returned to Phase 1-type activities following a brief interlude—Phase 2—in

which relatively more time was devoted to feasting and food-sharing than to more mundane domestic activities, such as cooking. However, a closer look at the *nature* of the cooking, serving, and storage assemblages of each of the phases, and how they vary over time, reveals that this is not actually the case. Firstly, while serving vessels constitute similar (though not identical) percentages of the Phase 1 (20%) and Phase 3 (26%) pottery samples, the characters of these assemblages are markedly different. The Phase 1 serving assemblage, as described above, is composed completely of finely made, large *tazones*, 50% of which are decorated in some way. In contrast, the Phase 3 assemblage is composed primarily of smaller, convex-walled *cuencos*, the vast majority of which (66%) are undecorated.

When only the *tazones* for these two phases are considered, a significant shift in the frequency of certain variants is clear. All of the specimens from the Phase 1 sample of *tazones* were classified in the B sub-category, which denotes a thickened exterior lip. However, by Phase 3, such lipped vessels comprise only 61% of the assemblage. While this may be purely stylistic, this shift could also suggest a change in the foodstuffs consumed or perhaps in the nature of food-related activities, such as serving or eating. Such a change would not have occurred suddenly, as the Phase 2 *tazon* assemblage consisted of 70% sub-type B variants, a frequency that suggests that any changes in food consumption patterns were part of a gradual, yet unmistakably deliberate, process. Interestingly, the portion of Phase 3 *tazones* that were decorated remained fairly consistent (47%) with the earlier occupation, however.

In addition to these changes in bowl form, when considered by phase, there is a clear reduction in mean bowl size over the course of the Formative (Figure 7.4); these shifts likewise reflect changes in food-related activities. Statistically significant variation among the three

samples was first determined using a Kruskal-Wallis one-way analysis of variance.²² A series of post-hoc Mann-Whitney U-tests was used to determine if the variation among the samples could be attributed to significant differences in their means. These tests indicated significant differences between the means of the Phase 2 and the Phase 3 samples ($p = 0.007$), as well as between the means of the Phase 1 and Phase 3 samples ($p = 0.009$). While the difference between the means of the Phase 1 and Phase 2 samples was not found to be significant below the 0.05 level ($p = 0.06$), this may be due, in large part, to the small size of the sample from Phase 1 contexts. The extremely low p value nevertheless suggests strong patterning in the data.

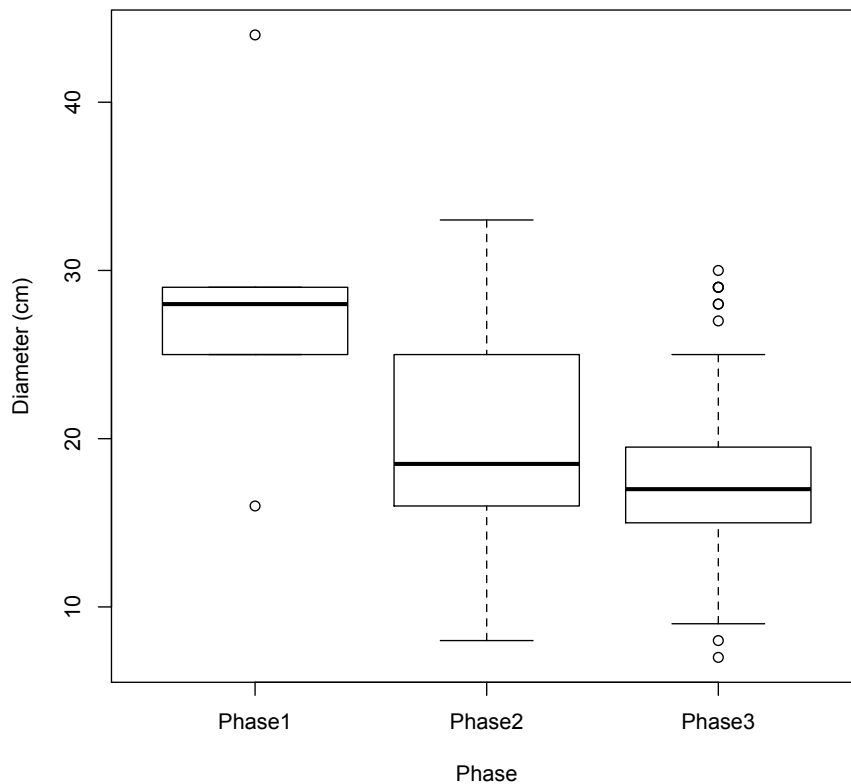


Figure 7.4. Boxplot showing decrease in mean bowl size over time

²² A Kruskal-Wallis one-way analysis of variance was used to assess the variability across the samples from each of the three Formative occupational phases, and the results ($H(2) = 13.22, p = 0.001$) indicate statistically significant differences among the three samples. We can therefore reject the null hypothesis that the three samples were drawn from the same population. This test was followed by a series of Mann-Whitney U-tests, a non-parametric test used to compare the means of two independent samples.

The composition of these three samples suggests two likely sources for the decrease in mean diameter over time. When the bowls of each of the samples are separated by into *tazones* and *cuencos*, two facts are evident: 1) only the *tazones* exhibit a statistically significant decrease in size over time,²³ and 2) the relative abundance of *tazones* declines over time. The *tazones* of Phase 1 are quite large, with a mean value of 28.4 cm. A substantial decrease in the average size of the *tazones* is seen in Phase 2 (mean = 21.43 cm), and again in Phase 3 (mean = 18.08 cm). In contrast, the mean size of the *cuencos*, which are notably absent from the Phase 1 sample, remains relatively constant from Phase 2 into Phase 3, with the two samples differing by only 0.01 cm.²⁴ Importantly, *cuencos* are, on average, much smaller than *tazones* (mean = 17.27 cm and 20 cm, respectively, $p = 0.0002$). It is therefore the case that the decrease in the size of the serving vessels over time may be attributed to both a decrease in the size of *tazones*, and an increase in the frequency of smaller-sized *cuencos*.

Data from ceramics collected from Profiles I and II substantiate the observation that earlier phases are associated with larger-sized serving wares. Sherds of six *tazones* were discovered in association with Structure PII-9, which was likely used for above ground storage during the Formative Phase 2 occupation. These *tazones* were quite large and range from 16-47 cm in diameter. In addition, a fragment of a very large bowl with a shelf rim (TA-5118-01) was found while cleaning Structure PII-9. This specimen is very similar to a large Qaluyu carinated bowl discovered by Cohen (PC13.577.7.1) in a ceramic cache deposited during the ritual “closing” of the first construction phase of Huatacoa’s middle sunken court complex (Cohen 2010:176, 180-182). Specimen TA-5118-01 was once part of an extremely large serving vessel

²³ The three samples of *tazones* were evaluated with a Kruskal-Wallis one-way analysis of variance. The results ($H(2) = 11.31, p = 0.003$) indicate significant differences between samples, once again allowing for the rejection of the null hypothesis.

²⁴ The two samples of *cuencos* were analyzed using a Mann-Whitney U-test, which indicated no significant differences between their means ($p = 0.91$).

measuring 50 cm in diameter, and its enormous size suggests that it may have been used to serve any people. While technically classified as a *cuenco* D3 according to Chávez's typology, this form is not at all consistent with the other *cuenco* sub-types, and I believe that this form may represent a separate class of special-purpose wares. In fact, Cohen herself notes that "large sherds like this are not generally found in standard discard contexts" (2010:180), suggesting a supra-household or otherwise non-domestic function for this vessel type. However, such large vessels forms are conspicuously absent from the Phase 3 serving assemblage.

Importantly, it appears that changes in food consumption practices, as evidenced by the reduction in bowl size of the Upper Formative assemblages, was not confined to the resident populations of Area A. A similar pattern was documented for the Late Formative 1 (ca. 200 BC-AD 300) bowls from Kala Uyuni, located to the south on Bolivia's Taraco Peninsula (Bandy 2007; Steadman 2007). The changes witnessed at Taraco are likely local manifestations of region-wide shifts in the nature of commensalism and in the foodstuffs consumed. Steadman suggests that, for the LF1 phase of Kala Uyuni's occupation, "serving patterns no longer involve large decorated bowls full of food to be shared communally, but rather smaller bowls sized for individual servings. Less food, or different foods may also have been served at these events, as stable isotope analysis suggests that...less meat/fish and more plant-based foods were now being served in special purpose contexts" (2007:110). It is vital to keep in mind, however, that while these bowls were used primarily in food-consumption, serving, or sharing activities, they were not necessarily restricted to these purposes; the multi-purpose nature of bowls will be discussed in greater detail below.

The assemblage of cooking vessels excavated from Area A likewise exhibits significant changes in size and form over time; these shifting patterns may speak to the kinds of

transforming food preferences and/or food-related activities that Steadman suggests for Kala Uyuni. As with the serving vessels, the size of the cooking vessels decreases over time, an observation confirmed by a Kruskal-Wallis one-way analysis of variance.²⁵ Furthermore, while the Phase 1 and Phase 2 cooking assemblages are dominated by neckless and short-necked *ollas* (Types D and E), by Phase 3, the frequency of these variants drops to a paltry 20% ($\chi^2 = 28.76$, $p < 0.0001$). By the third phase of the Formative occupation, necked cooking pots are the norm, and these vessels are nearly equally divided between flaring and straight-necked variants (N = 97 and N = 96, respectively).

The shifts in the frequencies of *olla* variants is important, as these different forms are probably related to different methods of food preparation and cooking techniques, and perhaps even different kinds of foods. Again, the move away from a predominately neckless cooking assemblage is not unique to Taraco, and is representative of a pattern that is shared by other sites around the northern Titicaca area, such as Camata, located in the western Basin. In her dissertation work at the site, Steadman (1995) discovered an important correlation between sooting/charring patterns and cooking pot form. She found that the sand-tempered neckless *ollas* of the earlier phases often exhibited extensive charring on their bases, indicating that they were usually placed over a fire. In contrast, the fiber tempered necked *ollas* of the later phases had likely been placed directly in the fire. Such a practice results in sooting on the middle of the exterior vessel wall, but an unsooted, oxidized base, because the base sits on the hottest area of the fire (where no smoke is formed; Steadman 1995:151). In these later phases, when the increasingly rare mineral-tempered neckless *ollas* are present, they do not share this distinctive charring pattern; rather, their exterior sooting indicates that, “these vessels continue to be used

²⁵ The results of the Kruskal-Wallis one-way analysis of variance ($H(2) = 9.6142$, $p = 0.008$) indicates statistically significant differences among the sample populations, allowing for the rejection of the null-hypothesis.

mostly over the fire” (Steadman 1995:151). These findings are highly significant, as the placement of cooking vessels in relation to a heat source reveals much about the nature of the food being prepared. When simmering or frying, for example, vessels need to be placed over, rather than into, the fire, whereas boiling requires the opposite placement (Rice 1987).

In addition, the charring patterns observed on the interior of the vessels suggest that different forms may have been used for the cooking of different types of foodstuffs. A complete fiber-tempered necked *olla* found at Camata exhibited a ring of charred food residues on the middle of the interior wall. This feature is key evidence suggesting that the vessel was used for the cooking of liquid foods, such as soup, as this ring only results when food particles, which float at the surface of liquid contents, are charred during later cooking (Kobayashi 1994; Skibo 1992:150-151; Steadman 1995:152). A complete neckless *olla*, lacking this signature, was instead likely used for the cooking of solid foods, such as porridge or grains.

While Steadman’s principal argument is the relationship between cooking methods and paste recipes (mineral versus fiber temper), her observation about the role of form is of particular importance for this study of the Taraco ceramics, in which all vessels were mineral tempered. Her analysis suggests that neckless and necked *ollas* may be associated with different kinds of food preparation techniques, and, by extension, different kinds of foods. The distinctive exterior sooting patterns of the Camata *ollas* suggest that necked vessels were most often used for boiling foods, and the interior residue of the complete vessel indicates that that these foods were generally in liquid form. These findings concur with a functional assessment of neck form by Rice (1987). She reasons that while it is generally useful to have cooking vessels with open orifices, which would facilitate the addition of ingredients and the removal of cooked food, the addition of a low neck can reduce evaporation and inhibits the boiling over of contents. In

contrast, the simmering or frying of solid foods would take place in vessels with a relatively more open orifice (Rice 1987: 239-240), such as those of neckless *ollas*. In light of this information, it is highly likely that the decreased popularity of neckless *ollas* in the Phase 3 occupation at Area A is related to an increase in the preparation and consumption of liquid or boiled foodstuffs.

Another trend worthy of comment is the shift in the storage assemblage over time. Not only is there a marked increase in the frequency of storage vessels, but also in the variety of the ceramic forms used for storage. Before addressing these changes in the storage assemblage, we must consider what was being stored, and for what purpose. Of course, some storage of agricultural produce is necessary in order to offset irregular yields and mitigate the effects of the extreme seasonality of the *altiplano* environment (Vallenas Ramírez 1992). The storage of preserved foods, such as *chuño* (freeze-dried potatoes) and dried grains, is well documented ethnographically (Sillar 2000), and dates back to at least the Middle Formative at the site of Chiripa (Oduor 2008; Roddick 2009). However, these dehydrated foodstuffs, which can be stored for several years (Vacher 1998), are more often kept in pits dug into patio surfaces and structure floors (Janusek 1994; Sillar 2000), rather than in ceramic containers. Such ceramic containers may have been used for the storage of other types of household staples, including perishable ingredients, fresh produce, dried meat/fish, water, or liquids that were not intended for long term storage.

It is also possible that these ceramic containers were used for the preparation and fermentation (and subsequent storage) of a specific liquid food: *chicha*. As *chicha* tends to spoil quickly, the beverage is generally consumed shortly after production, and storage is quite temporary. Although this activity is generally associated with very large-sized *tinajas*, recent

ethnographic work by Hayashida (2008) indicates that this is not always the case. She found that in many instances, *tinajas* are actually used for cooling and grinding the mash; the actual fermentation process takes place in narrow necked jars, known as *cántaros* or *mulos*. These are the same types of jars used for the storage of water, although water is never stored in jars used for beer. Moreover, jars used for fermentation and storage are often brought into the kitchen, away from the primary brewing area; large *tinajas*, due to their size, generally remain in place (Hayashida 2008). Ikehara (2010) has also discussed how the preparation of fermented drinks made from manioc likely involved the use of smaller-sized vessels, including neckless *ollas*. Thus, while no large *tinaja*-style brewing vessels were identified among the Taraco assemblage, this does not preclude the interpretation that the production and consumption of *chicha* was a regular component of domestic practice during the third phase of the Formative occupation.

It is unlikely that the basic nutritional demands of the average family would vary drastically, even over long periods of time. It is therefore reasonable to assume that, in the absence of external factors, the household storage assemblage should remain consistent over time. Such consistency, both in the size and in the relative proportion of storage vessels, has been documented by Robyn Cutright for the coastal site of Pedregal (2009:255). Observable changes in the nature of a household storage assemblage—either in character or abundance—must therefore be understood as a product of other processes and behaviors, which may include increased population density, changing food preferences, increased production of surplus, or changing environmental conditions, to name a few (Mills 1999). With regard to population size, ethnographic work has demonstrated no correlation between the size or composition of a household and number of ceramic vessels (DeBoer and Lathrap 1979:124). Although DeBoer and Lathrap cite a number of variables affecting households' vessel counts, (availability of

alternative materials, social factors, number/age of children, ability of the potter), the absolute number of residents is not one of them.

A likely factor influencing the proportion of the storage assemblage relative to other vessel categories is the availability of surplus foodstuffs. Availability of surplus resources is critical to the success of aspiring leaders; they are the foundation for public food sharing events, which function as arenas of social integration and status competition (Blitz 1993; Hayden 1990). It is difficult to determine whether the steep upsurge in the abundance of storage containers in the Phase 3 contexts reflects an increased *ability* to produce surplus food and other goods, or rather the increased *emphasis* on the production of surplus during the later phases. The former situation implies favorable environmental and/or technological conditions that permit the production of surplus (Hayden 1995)—did the climate suddenly become more favorable during the third phase of the Formative occupation? This hypothesis is not out of the realm of possibility; the Phase 3 occupation corresponds with a period (ca. 250 BC-AD 50) of relatively higher lake stands that approximate modern overflowing conditions (Abbott, et al. 1997). As such shifts are related to increased precipitation in the region, these wetter conditions could have facilitated an improvement in agricultural yields without much additional effort. The latter—a *prioritization* of surplus—suggests a conscious effort that would have required the intensification of agricultural systems. Under these circumstances, the generation of surplus is not simply a happy coincidence, but a “social strategy to extend alliances, reinforce obligations, and promote prestige” (Blitz 1993: 80). Under either of these conditions—or some combination thereof—the generation of surplus would have been an important development that permitted the adoption of new strategies for enhancing their factions.

The increasing diversity in the storage assemblage is yet another point of interest. This shift may suggest the storage of more *kinds* of goods, and not just simply *more* goods (Blitz 1993; DeBoer and Lathrap 1979). Among the Shipibo-Conibo, for example, DeBoer and Lathrap observed that different sized vessels within the same vessel class were given specific names and served separate functions; however, some crossover in use was noted: “Any vessel may serve as a general purpose container” (DeBoer and Lathrap 1979: 127). An increasingly differentiated and abundant storage assemblage may point to the greater needs of cooks imposed by an increasingly complex cuisine that required longer lists of ingredients or additional processing steps. While many changes in cuisine are associated with performance characteristics of vessels—specifically the shape or the fabric of cooking and serving vessels, as discussed above—Mills (1999) argues that new ways of preparing food, as well as the intensification in the consumption of specific kinds of foods, will affect vessel size. This is the case even for vessel categories that are not normally associated with the food preparation process, such as jars. Soaking grains prior to cooking, for example, requires the use of larger jars due to the expansion of the kernels (Tani 1994:56). In the Pueblo areas of the American Southwest, larger vessel sizes are linked with an increase in supra-household food consumption; in this case, jars may be used “as containers for the preparation of feast foods, as a means of transporting foods to other places where they are consumed, and as service to participants and audience” (Mills 1999: 104).

These studies help to contextualize the observed changes in the excavated storage vessels. The Area A assemblage, presenting increases in both the variety of storage forms and the relative proportion of vessels used for storage, indicates important shifts in a number of activity patterns. Of particular interest for this study are the large containers—*cantaros*—that only appear for the first time in the final phase of the Formative occupation. It is necessary to

keep in mind the multi-purpose nature of these vessels—as “containers” it is likely that these may have been used for serving or transporting beverages and liquid foods, in addition to household storage. These vessels, along with the *botellas*, effectively introduce new categories into the storage assemblage, a change that is consistent with increased supra-household food consumption, as well as more complex modes of food preparation. When considered with the sudden expansion of the storage assemblage, it is likely that the Phase 3 occupation was characterized by a major shift in economic practices that involved a greater reliance on surplus foodstuffs, the preparation of special foods (*chicha*, or perhaps more complicated recipes), and public food sharing.

Finally, the distribution of ritual paraphernalia across the Formative occupational phases is also notable. In contrast to elaborate serving wares, which are present in the ceramic assemblage from the site’s earliest occupation, ceramic ritual paraphernalia—trumpets and highly decorated *incensarios*—do not appear until the very end of Phase 2. This is an interesting contrast to the Formative centers of the southern Basin; at Kala Uyuni, ceramics “specifically associated with ceremonial activities” (Steadman 2007:73), namely trumpets and ceremonial burners, first appear in the Late Chiripa assemblage, ca. 800-200 BC. Of course, the burning of incense at Area A may have taken place in plainer or undecorated bowls prior to the end of Phase 2; in fact, some bases of undecorated open vessels exhibit characteristic sooting patterns on their interiors as early as Phase 1. I have personally witnessed plain ceramic bowls used for the combustion of incense in small-scale household rituals. It must be emphasized, however, that such vessels were not part of the specialized ceramic assemblage specifically intended to serve as braziers in public ritual or ceremonial contexts. Miniature vessels, and extremely small vessels

that may fit into this category, also do not appear until the final phase of the Formative occupation.

7.4.2 Decoration and style

The Formative pottery sample from the Area A excavation units contained a significant percentage of decorated specimens that suggest both Qaluyu and Pukara cultural affiliations (see Appendix G, specifically Figures G.6 G.21, and G.39). One quarter (N = 352) of the total assemblage was embellished in some way. Though the most common form of decoration is all-over slip, which is generally red, dark red, or red-brown in color, many sherds were adorned with more labor-intensive incised, painted, or modeled designs. While the majority of the designs are geometric, some specimens depict naturalistic or zoomorphic imagery. As described above, two of these are three-dimensional, zone-incised polychrome feline faces that likely served as appliques for Pukara ring-based incense burners, while a third is a zone-incised polychrome *tazon* fragment emblazoned with two felines facing each other. Interestingly, while superficially similar to many examples found in and around the site of Pukara, the two feline heads from Taraco (TA-1229-01 and TA-1986-01) diverge stylistically from these archetypal specimens in some important ways. For example, neither specimen exhibits a vertically divided eye, a feature shared by nearly all of the known examples; in both cases, the eyes are represented by concentric, zone-incised circles. The Taraco heads also lack the rays and the tear bands that characterize the classic Pukara specimens.

In contrast to these two examples, the style of the felines depicted on TA-1907-01 is strikingly similar to the feline headed snake motif described by Sergio Chávez (1992:752). This sherd shares a number of features with the illustrated examples, including the ring nose, the

slightly open mouth, and the placement of the two characters (facing each other; see Figure 7.5). Due to the fracture of TA-1907-01, it is impossible to determine if the figures have vertically divided eyes; however, the placement of the would-be black half of the eye on the side closest to the nose is consistent with that in Chávez's illustrations. TA-1930-01, a polychrome incised body sherd, exhibits another motif described by Chávez (1992:695), depicting what appears to be the curved snout of a camelid figure (Figure 7.6). Two other *incensario* sherds, determined to come from the same vessel, also depict part of a figure or scene; however, the exact nature of the iconography could not be discerned due to their fragmented state (Figure 7.7).

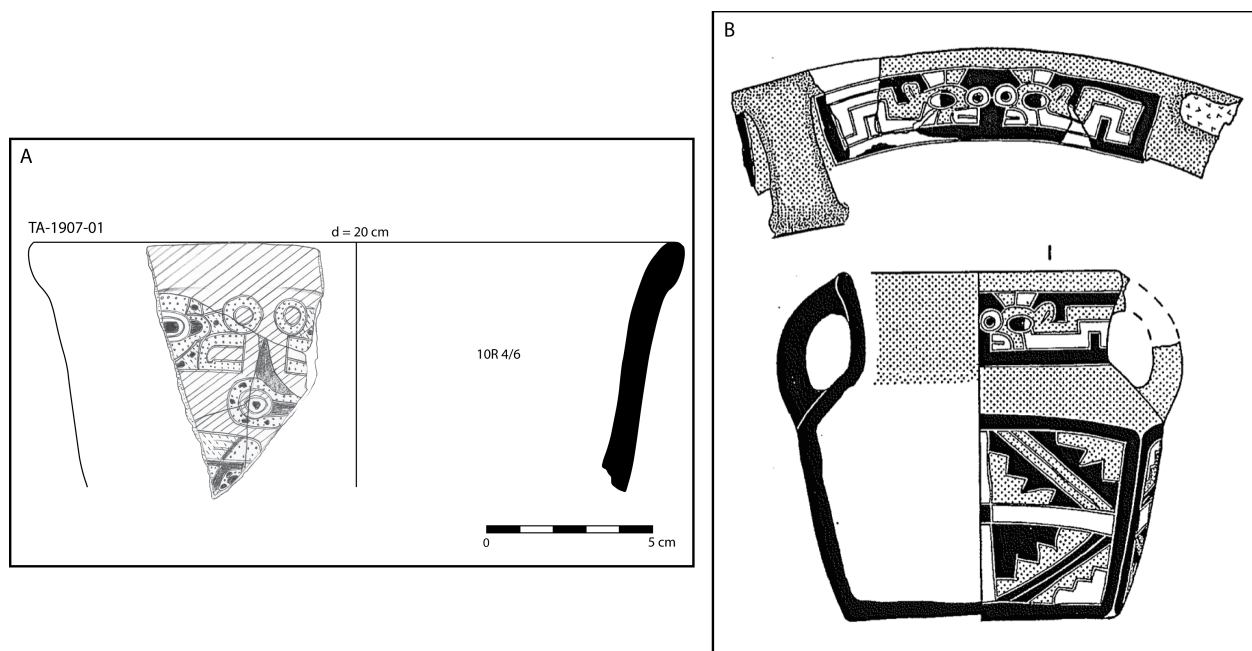


Figure 7.5 Zone-incised polychrome sherd from Taraco (A) depicting the feline headed snake motif described by Chávez (B, image not shown to scale)

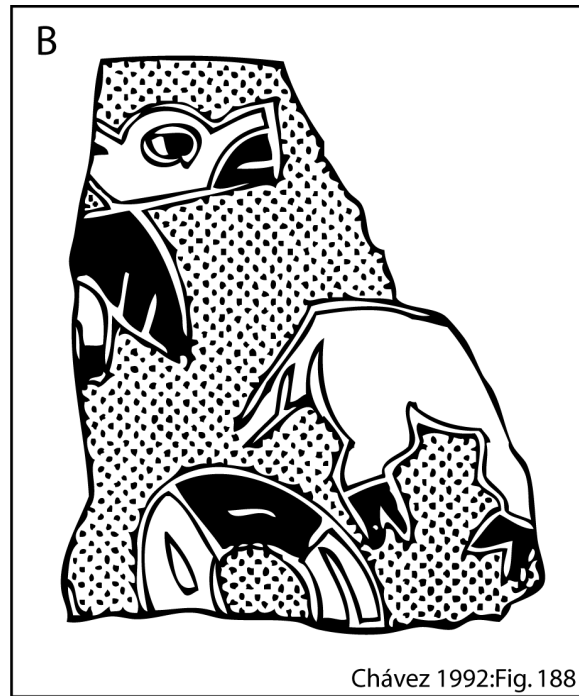
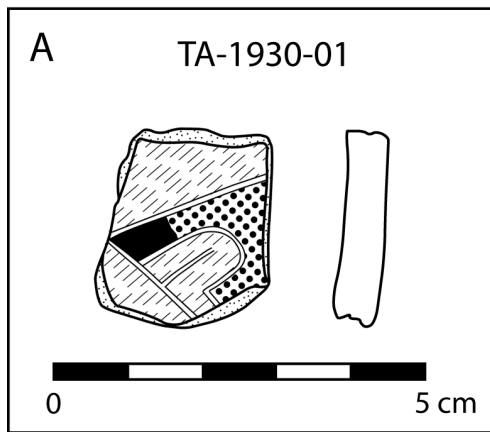


Figure 7.6. Zone-incised polychrome sherd from Taraco (A) possibly depicting camelid motif illustrated by Chávez (B, image not shown to scale).

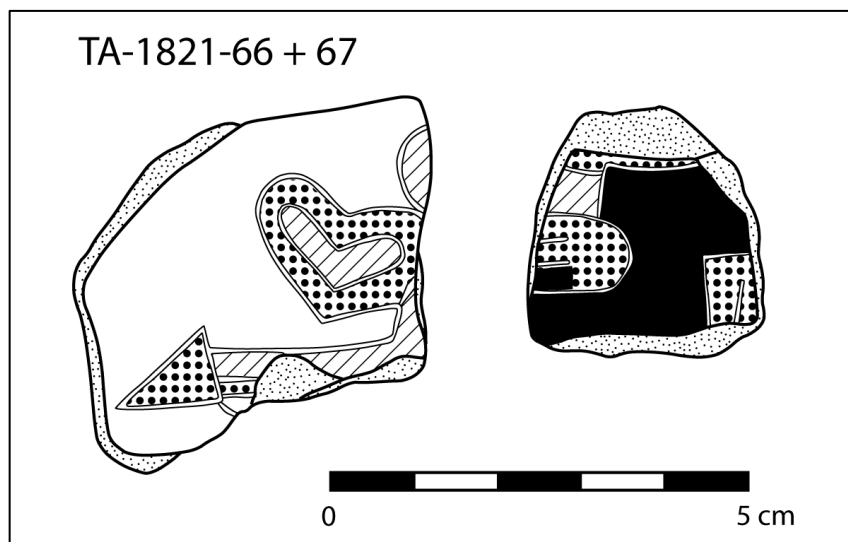


Figure 7.7. Polychrome zone incised *incensario* sherds.

A number of decorated forms were also unearthed during the cleaning of Profiles I and II. This sample includes a number of diagnostic types, such as *tazones* embellished with Qaluyu style wide-line incision, Qaluyu polychrome with hatched decoration, and Pukara zone incised polychrome wares (Figure 7.8). This sample from Profile I was also found to contain a large number of trumpet fragments. The abundance of such highly decorated and ceremonial specimens indicates a relatively high level of status for Area A, whose residents likely used these forms during special events or to signal prestige.

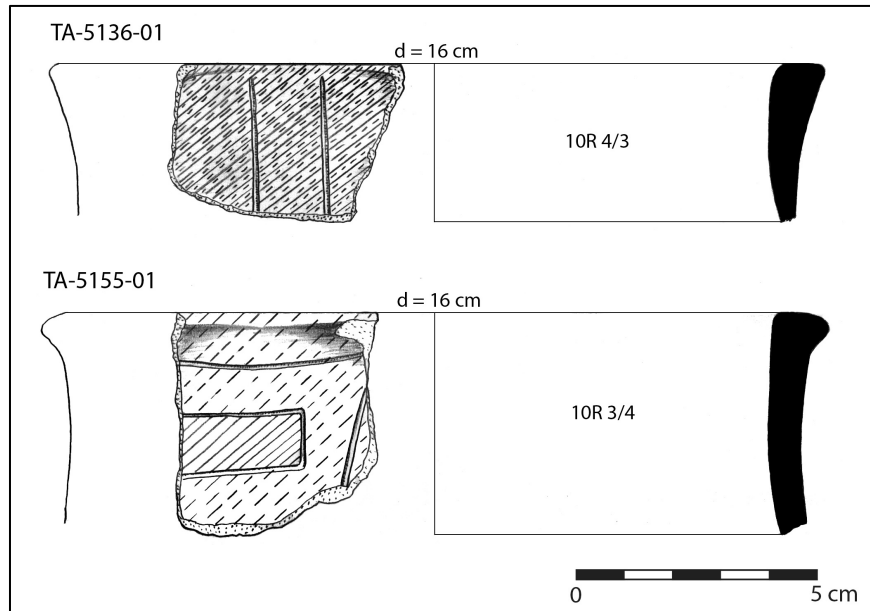


Figure 7.8. *Tazones* from Profile II with incised and polychrome decoration

When considered by phase, some temporal patterning of decorative styles is evident. Phase 1 is clearly associated with the Qaluyu decorative style, but contains no evidence of Pukara-style decorative elements. The Phase 2 and 3 occupations are associated with both styles. More specifically, the results of the analysis of the ceramics from the unmixed Phase 3 contexts provide unequivocal evidence for the contemporaneity of Qaluyu and Pukara-style fineware and indicates that the discovery of the smashed zone-incised polychrome bowl on the floor surface of

Structure UIII-1—which was found to contain wide-line incised pottery fragments in its matrix (see Chapter 6 for full description)—was not a mere fluke, nor a singular occurrence. The data from Phase 2 also suggest that both Qaluyu and Pukara finewares were simultaneously in use, at least for some length of time. These finds are consistent with the analysis of the radiocarbon record presented in Chapter 3.

Importantly, there is a substantial decrease in the abundance of non-domestic forms and finely made, highly decorated pottery from the pre- to the post-burn occupational phases. In the sample of pottery from a sealed, pre-burn floor context,²⁶ these finewares represent 12% of the sample. However, in the earliest post-burn activity surface,²⁷ finewares constitute only 2% of the total sample of pottery. This decline in the use of fancy pottery and non-domestic forms from the pre- to the post- burn is highly significant ($\chi^2 = 32.70$, $p < 0.0001$), and suggests a corresponding drop in, or shift in the nature of, the ritual-political activities that had been taking place at the site.²⁸

7.4.3 Analysis of paste: results

While non-diagnostic sherds could not provide information about the relationship between technology and form, the analysis of the highly abundant non-diagnostic sherds allowed for the evaluation of paste trends over time. As mentioned earlier, paste is both an important chronological marker, and provides important information about the technological choices made by the potters. Paste analysis characterized the ceramic fabrics (clay matrix plus inclusions) at

²⁶ The sample of pottery was recovered from Features UII-11 and UII-12 (a pit excavated into the floor). Additionally, sherds from the excavations in Unit I, which were determined to come from this floor based on excavation notes, drawings, and field forms, were also included.

²⁷ Huaña activity surface 2 (Stratum UII-VI).

²⁸ This analysis considers only the polychrome painted and/or incised wares, as well as trumpets (regardless of decoration), but excludes the allover slip decoration, which was the most common form of surface embellishment.

10x magnification for each individual sherd according to Chávez' typology, which includes information for inclusions, color, firing, surface treatments, and decoration. This typology was expanded and modified when new paste types were encountered during the course of analysis. As with the analysis of form, data from the paste analysis were recorded in a notebook and then transferred in a File Maker Pro database.

7.4.3.1 Total sample

For the Formative ceramic assemblage, paste was characterized for 8333 sherds; this figure includes the diagnostic specimens described above, as well as 6889 non-diagnostic sherds. This analysis identified 154 unique pastes that can be placed into 19 groups based on high levels of similarity. In Chávez' typology, similar paste "types" are organized into "paste groups," a classification scheme that helps to avoid the problems associated with the heterogeneous nature of ceramic fabrics and/or variable firing environments. For example, two sherds from the same vessel—or even two parts of the same sherd—may appear to have different paste "types" due to incomplete mixing of temper or other similar factors. The most common paste group in the total sample is the FII:II-7, representing 26% of the assemblage (N = 2182). In her report, Chávez characterizes the pastes in these groups as light brown to light orange in color. They are somewhat micaceous, and primarily contain high densities of white, sub-round inclusions (likely feldspars or quartzes), approximately 0.1 mm in size, that are regularly distributed through the matrix. The mica is generally platy, ranging in size from 0.1 to 0.8 mm, and is found in variable densities ranging from low to high. Pastes in this group also contain abundant quantities of sub-round translucent inclusions measuring up to 1mm in size, low to medium densities of sub-angular black inclusions (0.1 - 0.5 mm in size), as well as low levels of angular pinkish

inclusions. These pastes are semicompact with a fine texture, and often exhibit wiped or burnished finishes. With regard to firing conditions, sherds in paste group FII:II-7 are either completely or incompletely oxidized. In the materials from the Huancané-Putina survey, sherds in this group are associated with both Qaluyu and Pukara decorative styles.

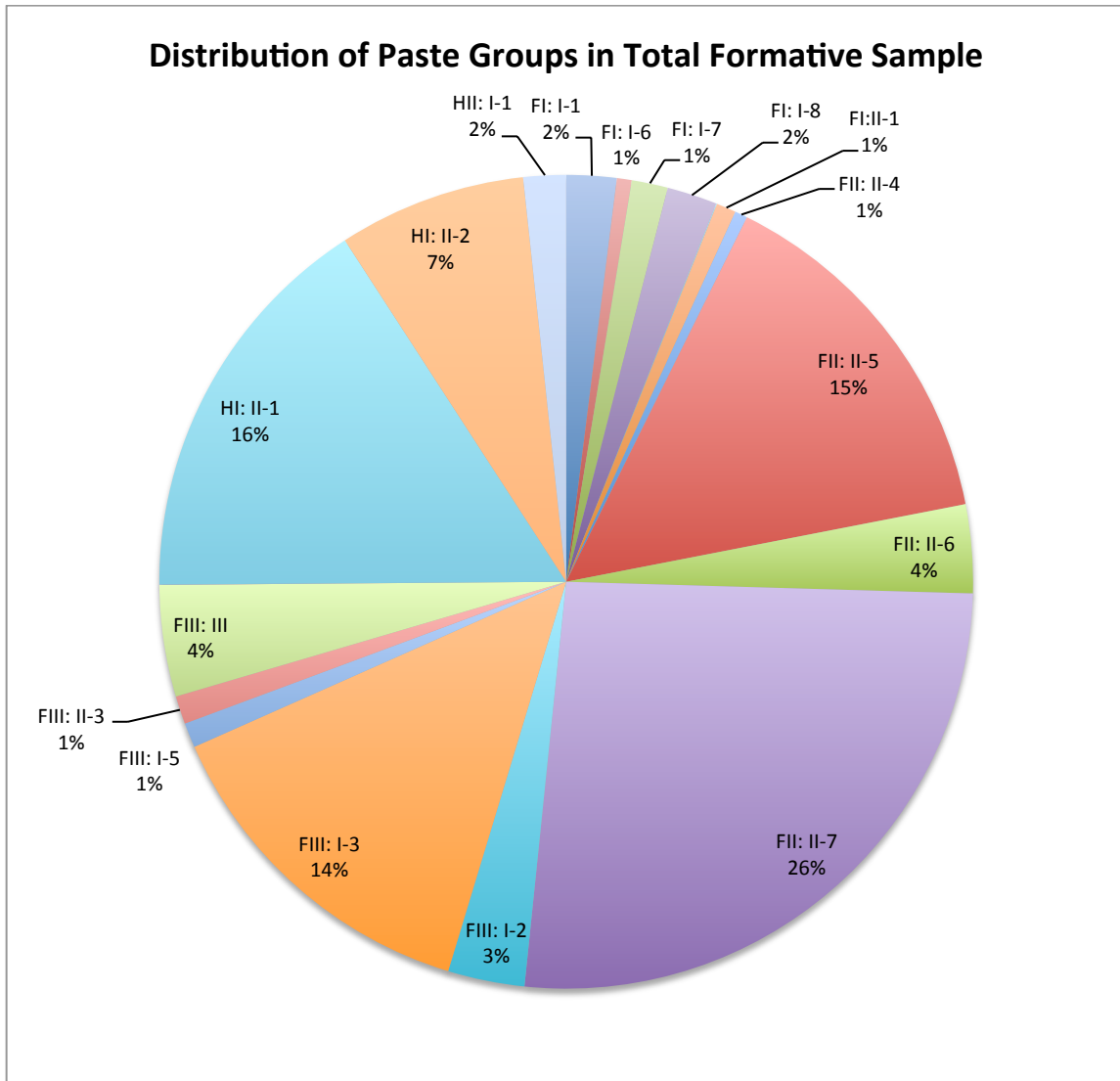


Figure 7.9. Distribution of paste groups in the total sample of analyzed ceramics

HI:II-1, FII:II-5, and FIII:I-3 are the next three most abundant groups, representing 16%, 15%, and 14% of the total sample, respectively. These three groups share many important characteristics, yet are distinguished by their colors and the relative abundances of their inclusions. Notably, for the Huancané-Puntina survey materials, all three groups are associated with Qaluyu and Pukara style decoration. HI:II-1 contains pastes that are light brown, orange, light orange, and red in color. They are characterized by moderate densities of sub-round, whitish inclusions measuring 0.1 mm in size. Pastes in this group also contain variable densities of sub-round blackish (0.05 - 0.1 mm) and translucent (0.05 - 0.1 mm) inclusions, as well as low densities of platy mica (0.2 mm). These sherds are completely or incompletely oxidized, and surfaces are generally wiped, though some polished specimens were also found. FII:II-5 contains light brown and light orange pastes. Sherds in this group are distinguished by their abundant quantities of sub-angular red and pinkish inclusions (measuring up to 1 mm). These pastes also contain moderate densities of sub-angular translucent inclusions (0.5 mm), as well as low densities of sub-angular black inclusions (0.5 mm) that are irregularly distributed. This paste group is also micaceous, with platy mica measuring 0.1 mm, with densities ranging from moderate to highly abundant. Finishing techniques including wiping, burnishing, and some polishing, and specimens are completely or incompletely oxidized. FIII:I-3 pastes are light orange in color. They contain variable densities of evenly distributed sub-angular whitish inclusions measuring approximately 0.1 mm. Sub-angular black inclusions (0.1 mm) are also found in variable densities, along with irregularly distributed, gold-colored platy mica. Oxidation of pastes in this group is complete or incomplete, and surfaces are treated with wiping, burnishing, and polishing.

None of the other paste groups identified in the assemblage come close to approaching the abundances of these four groups. The relative frequencies of the remaining paste groups can be found in Figure 7.9. Given the high relative frequencies of these four paste groups, which collectively constitute 70% (N = 5867) of the total sample, it is possible that they are the products of local manufacture, as the inclusions found in the finished products are often representative of the natural inclusions in the locally available clays (Arnold 2000:363). It is also necessary to consider that imitation and the sharing of information among artisans could also result in observable similarities in pastes, despite the involvement of multiple production loci that may exploit different raw material sources. If this is the case, then the similarities in paste reflect similar choices made by communities of producers (Roddick 2009), and not necessarily production from the same source material. These ideas—as well as the notion of the “criterion of abundance”—will be revisited in the discussion of the results of the LA-ICP-MS analysis in Chapter 8.

7.4.3.2 Temporal patterns of ceramic pastes

For the analysis of ceramic pastes, 8285 specimens could be assigned to one of the three Formative occupational phases. When the results of the paste analysis are considered by occupational phase, some interesting trends emerge. Foremost is the observation that it is neither the presence nor the absence of paste groups that defines an occupational phase, but rather that each of the occupational phases is characterized by a different *frequency* of the various *alfares* and paste groups. In fact, there is substantial overlap of *alfares* and paste groups for the three Formative occupations. The other notable pattern is that, while HI:II-1 pastes make up only 16% of the total assemblage, 97% (N = 1289) of sherds in this paste group are clustered in the sample

from Formative Phase 3 contexts. In Phase 3, HI:II-1 sherds comprise 20% of the assemblage. This observation is clearly visible in Figure 7.10, which shows the percentages of the various paste groups for each of the three occupational phases.

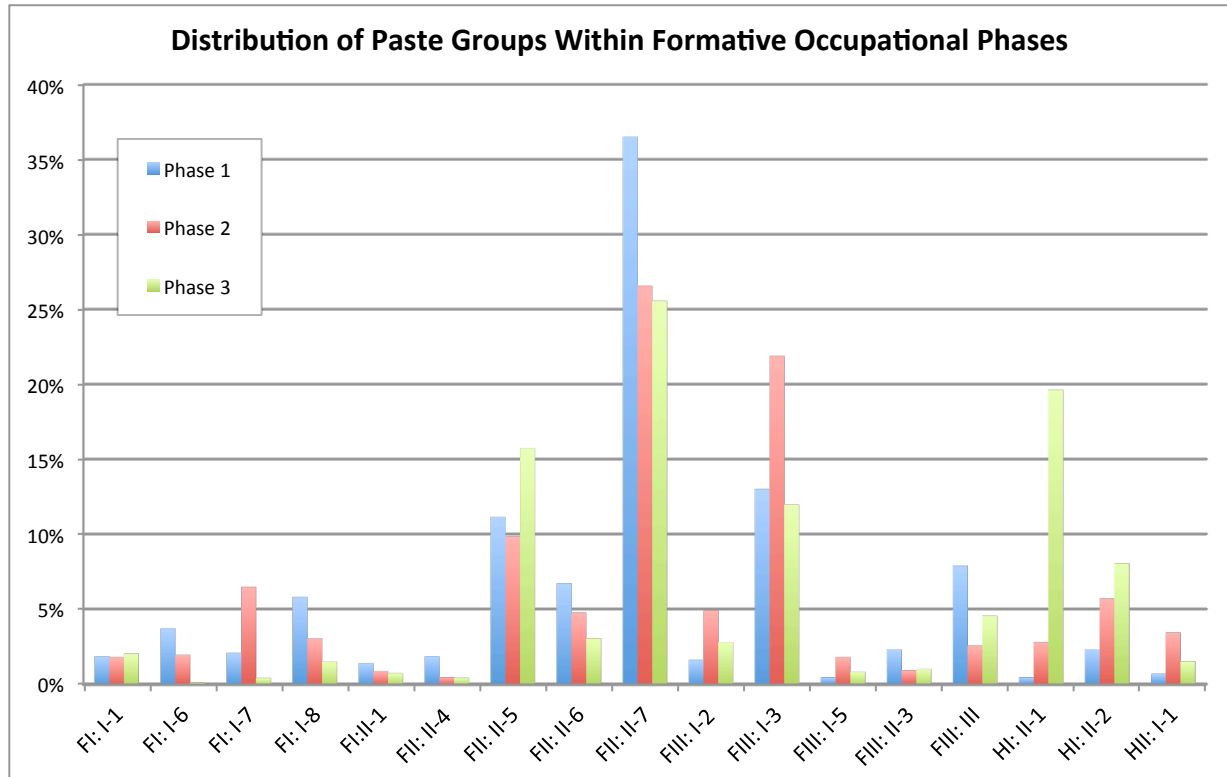


Figure 7.10

A similar, though far less extreme example is found for FII:II-7. As noted above, FII:II-7 is the most common paste group of the entire assemblage, representing 26% of the entire combined sample. This same percentage is reflected in—and remains relatively constant for—both Phases 2 and 3 (sherds belonging to group FII:II-7 comprise 27% and 26% of the samples, respectively). For the Phase 1 assemblage, in contrast, 37% of the sherds in the sample belong to group FII:II-7. However, unlike the previous example of paste group HI:II-1, where the majority of the sherds were clustered into one occupational phase, the FII:II-7 sherds found in Phase 1 (N = 157) represent only 7% of all the sherds in this paste group (N = 2179). The decline in the frequency

of this paste group in Phase 2 is nevertheless important, as it linked to rises in the abundance of other paste groups (for example, FIII:I-3 in Phase 2 and HI:II-1 in Phase 3).

Although a number of other paste groups are represented in the Formative Phase 1 assemblage (N = 430), none approach the abundance of group FII:II-7 (Figure 7.11). Echoing the trend of the total combined sample (all three occupational phases plus analyzed sherds from the two profiles), the second and third most common groups identified in the sample are FIII:I-3 and FII:II-5, respectively constituting 13% and 11% of the sample. Of the other 12 paste groups present in the sample, nine appear in frequencies of less than 5%. The majority (56%) of the Phase 1 assemblage is composed of sherds from the *alfar* Formativo II, while specimens in the *alfar* Formativo III constitute one-quarter of the sample. The *alfar* Formativo I is also well-represented (15%). While Huaña sherds are present in the sample from the Formative Phase 1 contexts, they only amount to 3% of the sample.

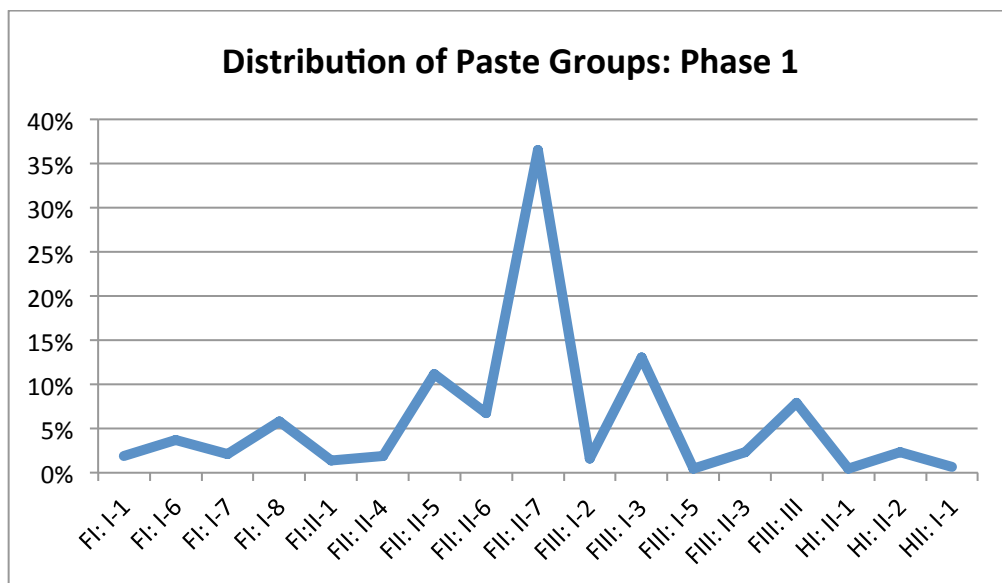


Figure 7.11

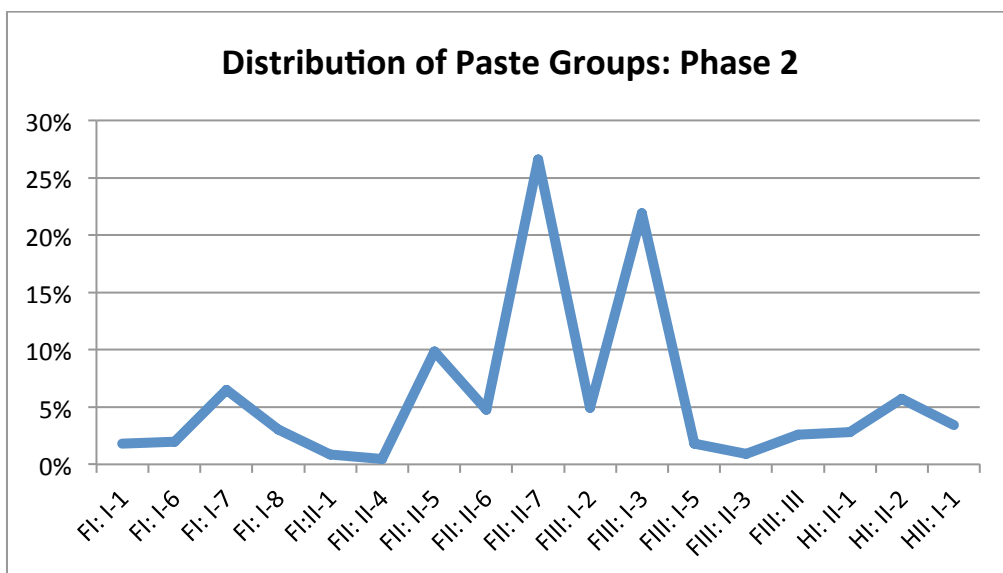


Figure 7.12

In the sample from Phase 2 (N = 1279), FII:II-7 remains the most abundant paste group, making up 27% of the assemblage; however, in a shift from the earlier Phase 1 assemblage, its frequency is nearly approached by that of FIII:I-3 (22%). In Phase 2, paste group FIII:I-5—a paste group generally reserved for the production of non-domestic forms and ritual objects—appears for the first time in measurable frequencies,²⁹ though it is only present in relatively low levels (2%). Also noteworthy is that group FII:II-4 disappears almost completely in Phase 2—a trend that persists into Phase 3. A slight decline from 8% to 3% is observed for group FIII:III. Interestingly, aside from these few important changes, the frequencies of the paste groups remain relatively consistent from the earlier occupation. Regarding the *alfares*, the frequency of sherds in the *alfar* Formativo II drops to 42%, a decline that may be explained by an increase in Formativo III sherds to 32%. There is almost no change in the abundance of sherds from the *alfar* Formativo I (14%). Finally, during Phase 2 there is a substantial increase in the frequency of Huaña sherds, which now make up 12% of the assemblage.

²⁹ Two sherds belonging to this paste group were identified for the Phase 1 assemblage; however this number resulted in a zero percentage value.

The Phase 3 assemblage (N = 6576) exhibits some important differences from the earlier two phases, which were dominated by one or two paste groups. The Phase 3 assemblage, in contrast, is characterized by the presence of four principal groups, in addition to a number of other subsidiary groups (Figure 7.13). Again, FII:II-7 remains the most ubiquitous paste group (26%) in the sample. The second most common paste group in the Phase 3 sample is the Huaña group, HI:II-1. This group was identified in the Phase 2 sample, but only in a frequency of 3%. By Phase 3, sherds in this paste group comprise 20% of the assemblage. The third principal group found in this assemblage is FII:II-5, which contains 16% of the sample. Although it experienced a decline in frequency from Phase 2, FIII:I-3 is the fourth of the principal paste groups found for Phase 3, with its constituent sherds amounting to 12% of the assemblage. Of the other 10 paste groups identified in the Phase 3 sample, only one (HI:II-2) was represented in a frequency of greater than 5%.

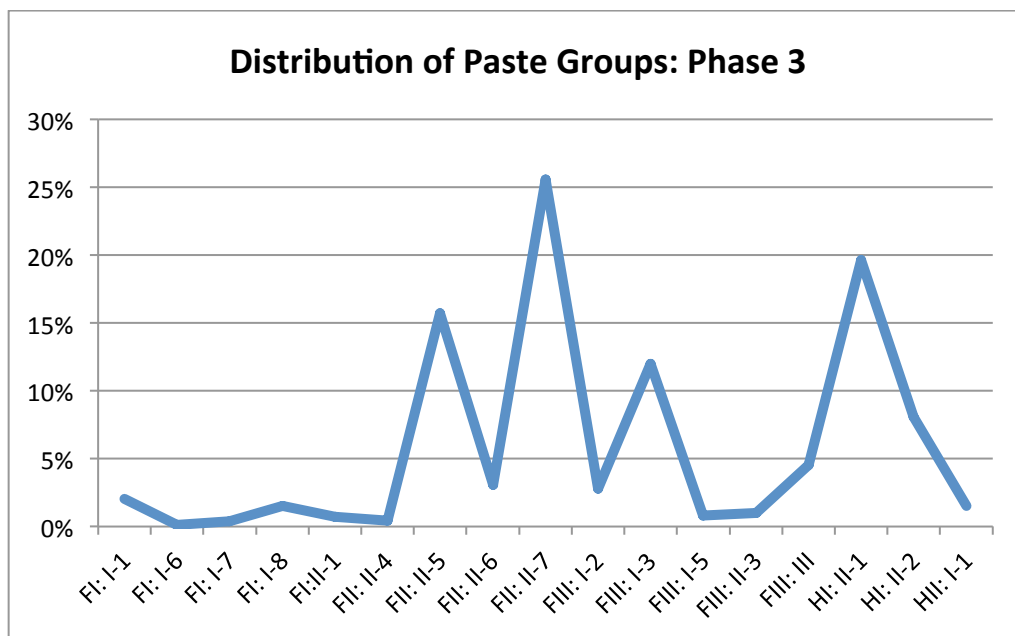


Figure 7.13

It is also clear that by Phase 3, the frequency of sherds in the *alfar* Formativo I decline dramatically, and make up only 5% (N = 316) of the assemblage. This stands in marked contrast to Phases 1 and 2, in which groups in this *alfar* constitute notable proportions of these samples (15% and 14%, respectively). Interestingly, while there is a decline in the abundance of sherds from the *alfar* Formativo III to 21%, there is little change in the frequency of sherds from the *alfar* Formativo II (45%). A striking increase in the frequency of Huaña sherds is also evident for this period; sherds in this *alfar* now amount to nearly one-third (29%) of the assemblage.

The results of this analysis have important implications for our understanding of ceramic chronology for Taraco site area and the geologically similar surrounding area. As these sherds were excavated from secure, stratified contexts that are associated with radiocarbon dates, they present an opportunity to make general statements regarding both shifts and stasis in the ceramic industry over time; these findings can be applied and tested in future excavation contexts. Of these findings, of paramount importance is the observation that, for Formative sites, it is neither the presence nor the absence of a paste group that defines the age or the affiliation of an excavation context, but rather it is the relative abundances of the various groups that may provide important chronological information. Just as both Qaluyu and Pukara-style designs co-exist within the same time periods, so too paste groups overlap substantially in time. Despite any general trends that might suggest some measure of temporal exclusivity, this study clearly indicates that the majority of ceramic recipes persist for extremely long periods of time.

A final conjecture concerns the Huaña period *alfares* and paste groups. The concept of Huaña—what it is and what it represents—is still in the process of becoming understood, but, as discussed in Chapter 3, it refers to the loosely aggregated northern Titicaca polity with no recognizable fine pottery style that roughly corresponds with the period of Tiwanaku expansion.

In her analysis of the materials from the Huancané-Putina survey, Chávez, following Stanish (2003), initially uses the term “Huaña” in reference to the post-Formative, non-Tiwanaku occupation of the region. Through the application her new methodology, she discovered a series of Huaña pastes, a group of ceramic fabrics that were qualitatively distinct from any of the Formative and Tiwanaku paste groups. These pastes were used to manufacture the ceramic forms, shapes, and sizes typical of the Formative Period. However, these vessels were not simply undecorated specimens, as originally hypothesized. During her analysis she also discovered paste groups from the *alfar* Huaña I associated with Qaluyu and Pukara-style decoration—designs with unambiguously Formative affiliations. It is likely for this reason that such distinctive pastes have been, up to this point, lumped together with Formative assemblages, and not seen as something representative of a perhaps separate phenomenon. In light of these finds, she suggests that the transition from the Qaluyu to the Pukara style may not terminate in the Upper Formative (generally associated with only the Pukara style) but rather may continue up to “Early Huaña” period, to which she tentatively assigns the date range AD 100-400. Extrapolating this idea, she proposes that, with additional data, Huaña I pastes may ultimately prove *contemporary* with the Qaluyu-Pukara transition, which she currently dates to 750-200 BC; such a finding would potentially extend the Huaña I pastes even farther back in time. Pastes in the *alfar* Huaña II, on the other hand, are almost exclusively associated with expansive Tiwanaku style decoration, although, on occasion, they are seen in combination with Formative designs.

The new data from the Taraco excavations lend support to these final propositions, and indicate substantial longevity for Huaña paste recipes. Perhaps even more importantly, these new data indicate a relatively early use of Huaña pastes. Huaña pastes—from both *alfares* I and

II—are present even in the earliest occupation of Area A; they are not restricted to the post-Formative, or even to the Upper Formative, occupations. Though the frequencies of these paste groups are admittedly quite low during Phases 1 and 2, they actually outnumber several of the other paste groups from the *alfar* Formative III.³⁰ During the analysis of the Formative period sample, it was also noted that some Huaña I pastes were even used to manufacture some of the ceremonial serving wares that were used during the Phase 3 occupation. Such characteristic forms, together with elaborate surface decoration that includes allover slip and even incised polychrome designs, often makes vessels made from Huaña pastes superficially indistinguishable from those produced using the more typical Formative pastes. Also significant is the fact that while the abundance of Huaña I pastes increases dramatically over time, the frequency of Huaña II pastes never climbs above 3% (in Phase 2), another find that is consistent with Chávez’s conclusions. Pastes in this *alfar* only become common in the post-Formative occupations that follow the burn event. In the diagnostic ceramic assemblage (N = 705) recovered from Huaña Activity Surface 2 (Stratum UII-VI), for example, Huaña II sherds amount to 34% of the sample—a 17-fold increase from the Formative Phase 3 sample. This post-Formative sample was also found to contain 45% Huaña I sherds, but only 21% Formative sherds, approximately half of which were from the *alfar* Formative III. This sudden and profound increase in the abundance of Huaña II sherds suggests that this *alfar* may be more temporally diagnostic than Huaña I, signaling a post-Formative affiliation for a given archaeological context.

Based on the results of this analysis, I also argue that those paste groups labeled as “Huaña” may actually represent a local ceramic tradition. As discussed above, if we are to follow Arnold’s criteria, the abundance of sherds from Huaña paste groups suggests that they are

³⁰ The low frequencies of some paste groups from the *alfar* Formative III would be expected, given the radiocarbon dates for these occupational phases.

likely products of locally available materials. The fact that many Huaña pastes were identified and defined during the analysis of the Taraco sample, substantially expanding the typology as defined with the Huancané-Putina materials, lends further weight to this hypothesis. Given that the Huaña pastes are technologically distinct from the Formative pastes, these pastes likely follow a separate chronological trajectory, one that runs in tandem with the more traditional conception of ceramic chronology. Throughout the Formative occupation of Area A, Huaña pastes co-exist with pastes from all three Formative *alfares*; they only become commonplace in the third—and final—phase of the Formative occupation. By the post-Formative, the coarser (and all-around aesthetically inferior) Huaña paste groups outnumber the Formative groups by several orders of magnitude. Conceiving of Huaña as a local innovation helps to explain their persistence from the earliest phases and their subsequent explosion in popularity during the post-Formative, following the devastating burn event.

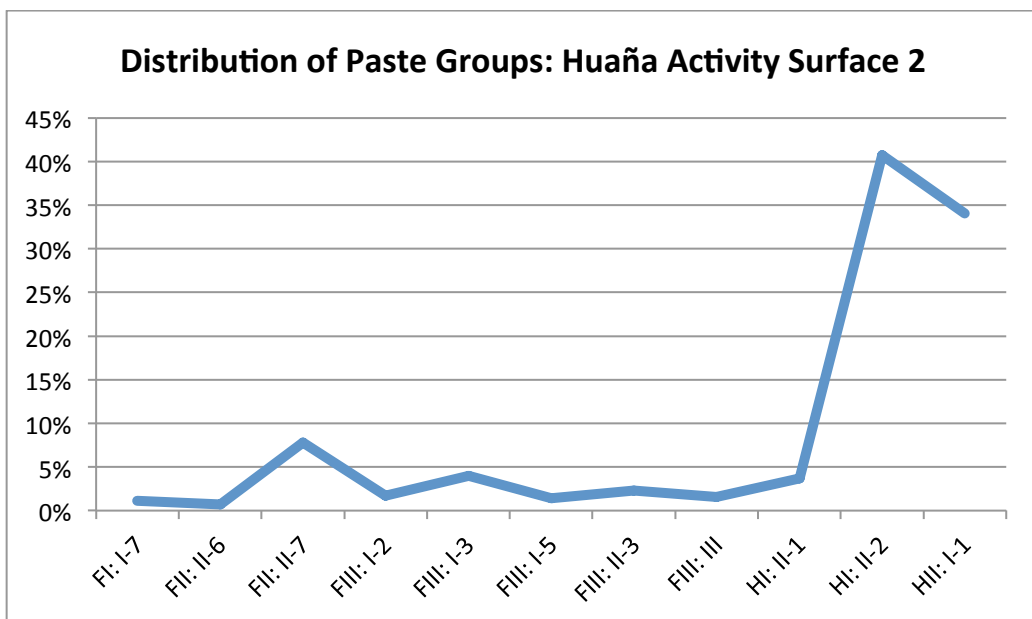


Figure 7.14

As seen in Figure 7.14, out of the three Formative paste groups that characterize the majority of the Phase 3 sample, none of these remain dominant in the post-Formative; one of them (FII:II-5), in fact, has disappeared completely. The sample from Huaña Activity Surface 2 is composed almost exclusively of pastes in groups HI: II-2 and HII: I-1, and only 2% are decorated finewares.

In some ways, it is surprising that a suite of pastes that had always been part of artisans' toolkit ultimately comes to define the post-Formative occupation of the site. However, it is likely that the increase of these groups in the post-Formative may be due to the fact that, with the loss of economic and political status that followed the burn event, residents no longer had the incentive—or perhaps even the ability—to participate in regional economic activities. Along these lines, it may also point to a major reorganization of the regional economic system. While the choice of ceramic paste surely has a technological basis, paste must also be considered as an important advertisement of affiliation. Typical “Formative” paste types are well represented across the far northern Titicaca area, with many sites sharing similar paste recipes. Whether the residents of Taraco were deliberately excluded from the regional political economy following the burn event is unclear. What is evident from the paste analysis, however, is that residents were no longer using the same paste recipes as Pukara, their powerful neighbors to the northwest, who continued to produce classic Formative wares until no later than AD 400. To borrow Roddick's terminology, assuming local production, Taraco no longer participated the regional community of practice following the burn event. The decline in the frequency of Formative paste groups, much like the decline in the use of fancy pottery, may reflect a both a decline in status as well as a movement towards economic and political activities that were far more local in their scope.

Further analysis of pottery from other contemporary sites in the area will permit the testing of these ideas and will aid in a better understanding of the nature of the Huaña paste groups.

7.4.3.3 *Paste and form*

A review of the data indicates that no paste group is restricted to any single form category, nor are any of the form categories composed solely of one (or even two or three) paste group. In fact, the reverse is true—for the most abundant form and shape categories (*ollas*, *tazones*, *cuencos*, and *jarras*), nearly all of the paste groups are found in some measurable frequency. However, this observation does not preclude the existence of some important formal trends for the various paste groups. Again, it is not the presence nor absence of paste groups within formal categories that are notable, but rather the frequencies with which these groups appear, both within and across the different form and shape categories. Looking the distribution of ceramic forms for each of the paste groups (Table 7.1 and Figure 7.15), several patterns are evident. First, when the sample is considered by form, it becomes clear that the most ubiquitous paste group in the sample, FII:II-7, is not evenly distributed across each of the categories. In fact, for those sherds in group FII:II-7 that could be assigned to a form or shape category,³¹ most were identified either as *olla* (43%) or *jarra* (20%) fragments. Relatively equal concentrations of *tazones* (16%) and *cuencos* (14%) were also found. However, this paste was rarely used for the manufacture of tools and non-domestic forms (trumpets and *incensarios*). Likewise, sherds in the group FII:II-5 cluster primarily in the *olla* form category (61%). This paste group is less frequently utilized for serving wares (14% *tazones* and 10% *cuencos*), and includes very few

³¹ 48% of FII:II-7 diagnostic sherds could not be assigned to any form or shape category; these “undetermined” sherds include handles, bases, decorated body sherds, and eroded/insufficient specimens. The percentages reported hereafter refer to total samples that exclude sherds for which a form could not be determined.

examples of tools and non-domestic forms. Group HI:II-2 also follows this trend with 57% *ollas*.

Other paste groups follow an opposite pattern, and appear concentrated in form categories associated with non-domestic, or otherwise special, activities. Group FIII:I-5, for example, is associated primarily with serving (43%) and ceremonial³² (22%) wares, and is only infrequently used for the manufacture of cooking vessels (11%). Similarly, 28% percent of the sherds in paste group FIII:II-3 were classified as *incensarios*, while only 6% were identified as *ollas*. Finely made serving wares (*tazones*) and musical instruments (trumpets) also constitute relatively large percentages of the FIII:II-3 sample (22% for each of these form categories). Highlighting the multipurpose nature of paste groups, examples of such utilitarian forms as *jarras*, *cantaros*, and ceramic tools were also identified for this paste group. However, as with the *ollas*, these were only present in minimal frequencies.

This final paste group is especially intriguing because it only amounts to 1% (N = 93) of all sherds selected from the Formative contexts. The unevenness of its distribution across the form and shape categories nevertheless warrants closer examination. According to Chávez's description, the pastes types in the group FIII:II-3 are fine-textured, and light brown to light orange in color. They are micaceous, and characterized by moderate concentrations of sub-round whitish inclusions measuring approximately 0.05 mm, which are evenly distributed throughout the matrix, as well as moderate densities of sub-round black (approximately 0.05 mm) and translucent (approximately 0.1 mm) inclusions. The mica, which is regularly distributed in low densities, is platy and gold in color, usually measuring less than 0.1 mm in size. Mica is visible in both the fresh cut of the sherd as well as on its interior and exterior

³² Trumpets and *incensarios*

surfaces. Surface treatments include wiping and burnishing, and oxidation is usually complete or incomplete.

A look at the distribution of paste groups within form categories (Figure 7.16) reveals that nearly half (45%) of all *incensarios* and 25% of all trumpets in the total Formative sample are composed of pastes from group FIII:II-3. Interestingly, pastes in this group make up only 3% of *tazones*, which appear to be much more variable in composition than the ritual objects. This information indicates that while FIII:II-3 was not very common, it was nevertheless an important, and perhaps highly valued, paste group that was generally reserved for the production of special-purpose, non-utilitarian forms. This finding also indicates that special care was taken in the production of these high status ritual objects; low compositional variability could be indicative of fewer numbers of producers, or that their manufacture was perhaps restricted in some way. In contrast, the diversity of pastes found for *tazones* suggests that the production of this form was not highly standardized, and does not suggest that their production was being limited.

	Formative I								Formative II					Formative III					Huaña I				Totals						
	FI: I-1	FI: I-6	FI: I-7	FI: I-8	FI: II-4	FI: II-5	FI: II-6	FI: II-7	FI: II-7	FI: I-2	FI: I-3	FI: I-5	FI: II-3	FI: III	FI: III	FI: III	FI: II-1	FI: II-2	FI: II-1	FI: II-2	FI: II-1	FI: II-2		FI: II-1	FI: II-2	FI: II-1	FI: II-2	FI: II-1	FI: II-2
Tazones	10	1	6	5	0	11	2	23	3	21	2	4	10	11	2	2	11	2	2	2	2	2	2	2	2	2	2	2	113
Cuencos	2	1	4	1	1	8	4	20	5	21	6	1	12	19	8	4	8	4	4	8	4	8	4	8	4	8	4	117	
Platos	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Ollas	13	2	7	6	2	48	14	61	10	29	2	1	27	56	20	3	301											301	
Jarras	4	2	2	13	1	5	9	28	5	10	5	1	17	33	5	5	145											145	
Cantaros	5	0	0	1	0	3	0	5	0	3	0	1	3	7	0	1	29											29	
Botellas	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	3											3	
Incensarios	0	0	1	0	0	0	0	0	0	3	2	5	0	0	0	0	11											11	
Trompetas	0	0	1	0	0	2	0	2	0	5	2	4	0	0	0	16												16	
Tools/Other	0	0	0	0	0	2	1	3	1	4	0	1	0	2	0	1	15											15	
Undetermined	40	6	15	24	4	73	24	132	23	100	24	19	53	94	40	681												681	
Totals	74	12	36	50	8	152	56	274	47	196	43	37	123	223	75	1433												1433	

Table 7.1. Distribution of paste groups by form type

Distribution of Form Categories Within Paste Groups

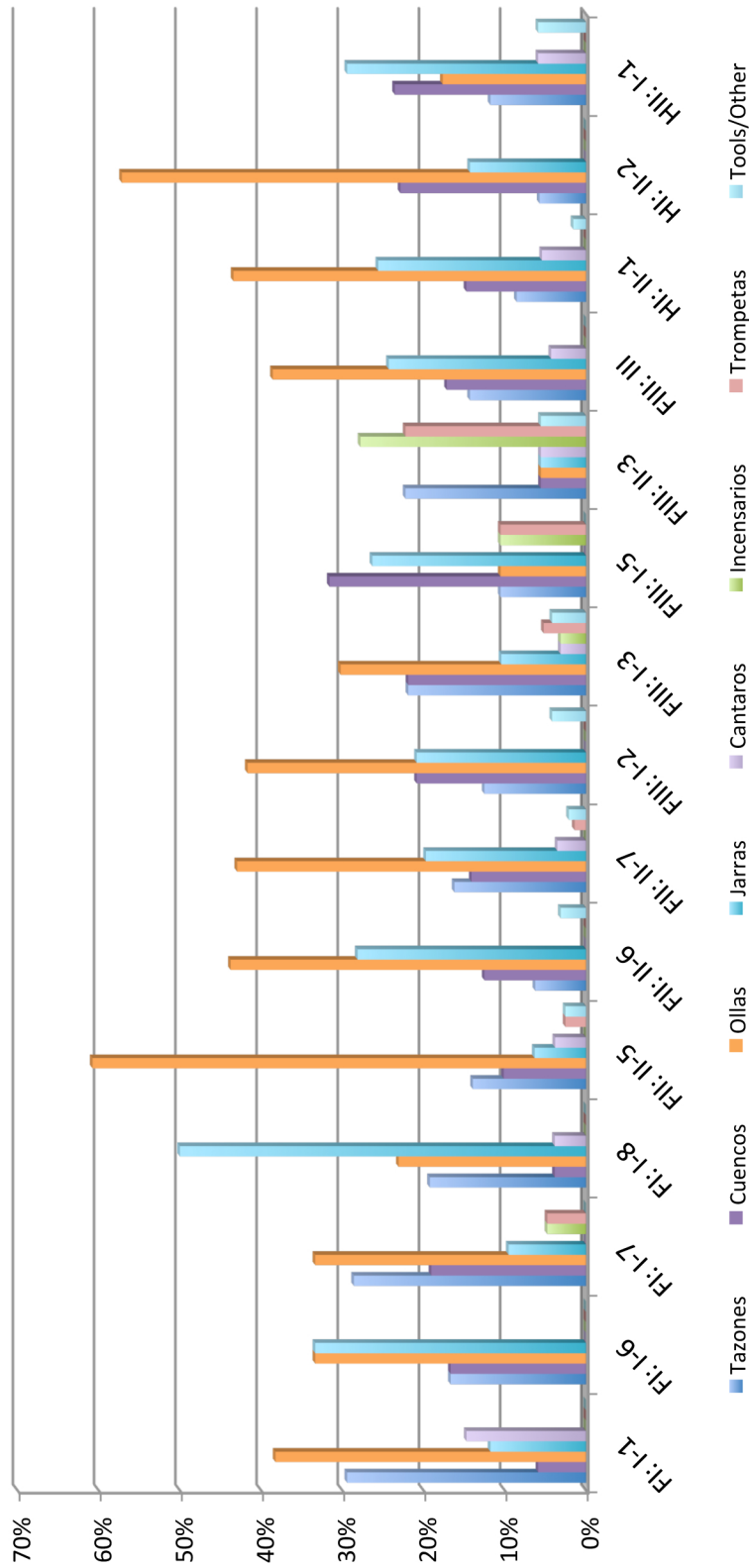


Figure 7.15

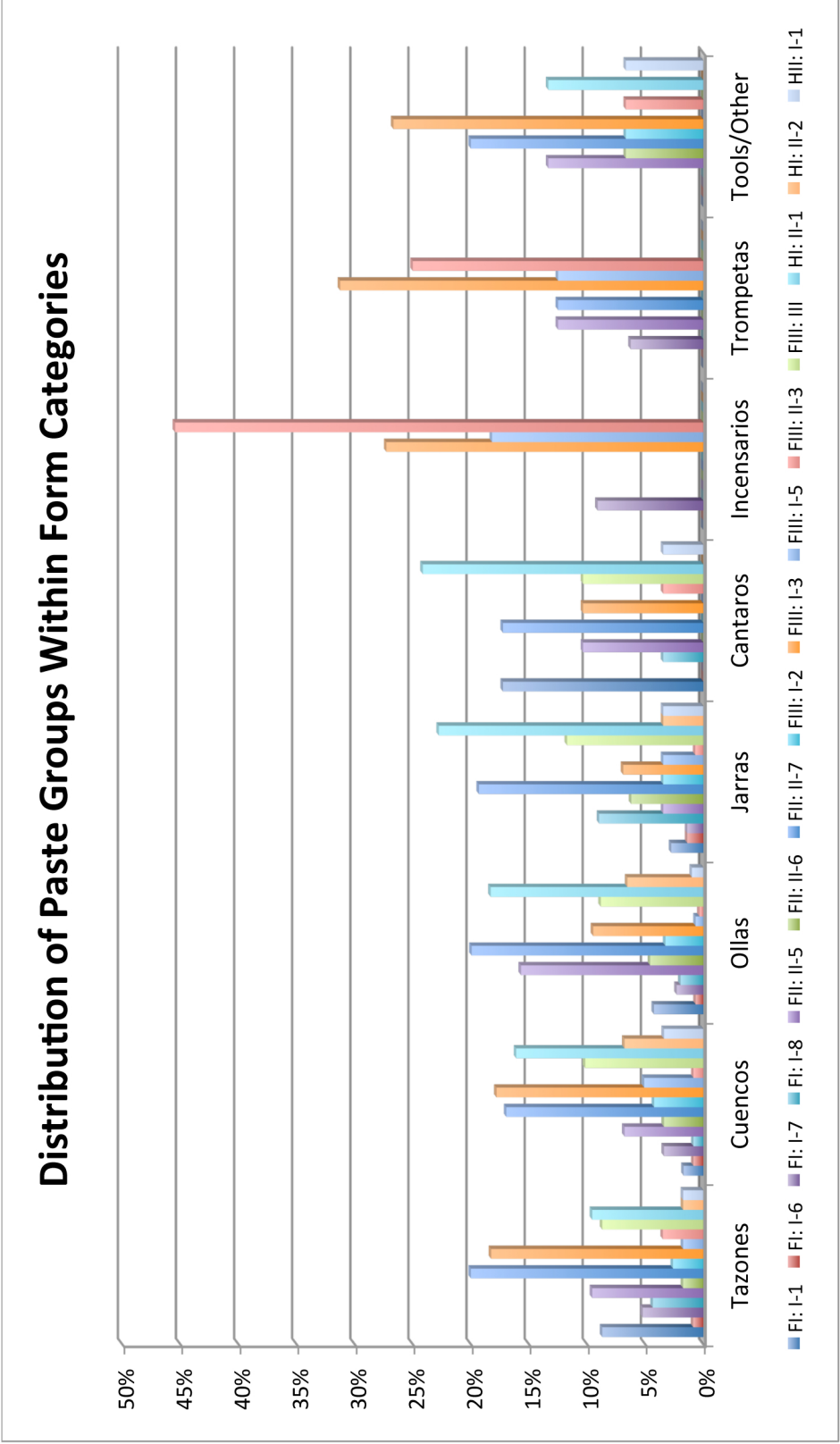


Figure 7.16

7.4.4 Petrographic considerations

Although petrographic analysis of ceramic materials from Taraco is ongoing, preliminary analysis of the thin sections has already identified distinct patterns in the sample. A survey of the total sample has indicated that nearly all of the samples fit into one of four categories. The first category consists of sherds with high concentrations of biotite, but few other inclusions. The second category contains sherds tempered with crushed volcanic rock—usually basalt or andesite. The third category includes sherds whose primary inclusions are quartz and plagioclase feldspars; the angular shape of these minerals, indicating a lack of weathering, suggests that they derived from crushed igneous rock, and were added to the clay matrix by the potters. The fourth and final category also consists of sherds with primarily quartz and plagioclase feldspars; however, in contrast to the third category, the inclusions of this group exhibited high degrees of weathering, indicating that these were likely sands that were naturally introduced into the matrix during the clay formation process. It is also a very likely possibility that sand collected from riverbanks was being used as temper.

Within each of these categories, variation exists in terms of the relative abundance, shape, and size of the inclusions. More detailed petrographic analysis will undoubtedly refine these categories and their subdivisions. Nevertheless, the information recovered helps shed light on the nature of the distinctions among the macroscopically defined paste categories. It is interesting, though not surprising, that so many macroscopically distinct paste categories derive from only four basic mineralogical categories. This finding, in itself, suggests a high level of inventiveness or creativity, in terms of clay preparation, on the part of the artisans. Moreover, such high levels of variation in the output—the paste of the finish product—are consistent with

large numbers of producers, and is a further indication that ceramic production in the Formative period was not highly standardized.

CHAPTER 8: MONITORING LOCAL AND LONG-DISTANCE EXCHANGE

8.1 Introduction

The excavations of the high-status residential sector at Taraco yielded data that permit the evaluation of residents' economic activities. These evidence indicated that early residents were active participants in the regional political economy and utilized a host of exotic materials and prestige goods. In earlier chapters it was hypothesized that trade, at the very least, was a correlative factor in the relatively rapid rise of complex societies in the far northern Titicaca region. Defining patterns of the manufacture and distribution of these artifacts is essential for understanding the nature of Taraco elites' involvement in the local and long-distance exchange networks that are vital to political success. This chapter presents the results of the compositional analysis of obsidian and non-domestic ceramic finewares, and examines patterns of production and exchange on spatial and temporal scales. These quantitative data suggest that trade activity in the Taraco area intensified immediately prior to the burn event.

8.2 Non-utilitarian ceramics

Laser Ablation Inductively Coupled Plasma Mass Spectrometry was used for the geochemical characterization of finely made, high-status ceramic objects. All ICP measurements in this study were made using the Varian Ultramass Quadrupole ICP-MS (Elliott, et al. 2004) housed at the Elemental Analysis Facility (EAF) at the Field Museum of Natural History. This analysis followed protocol previously established by Laure Dussubieux (Dussubieux, et al. 2007), director of the LA-ICP-MS Laboratory, and Mark Golitko (2010). A New Wave UP213 laser ablation system was used for sample introduction. This system uses a 213 nm wavelength laser, which was run at 70% energy (0.2 mJ) and a pulse frequency of 15 Hz. A helium/argon carrier gas was used to sweep the ablated sample material into the argon plasma, where it was ionized and passed into the mass spectrometer. The ICP-MS was set to peak jumping mode with one point per peak and a dwell time of 18,000 μ s. Each measurement consisted of nine replicates per measurement spot for a total of ~60 seconds of acquisition time, and the entire mass range was scanned three times per replicate. In order to account for any surface contamination and allow for the stabilization of the signal, the first three of these replicates were eliminated during data processing. The remaining six replicates were averaged to produce a raw signal strength, measured in counts per second, for each ablation spot.

For each sample, isotopes of 58 major, minor, and trace elements were measured. Using the Field Museum instruments, sensitivity for the trace elements ranges between 1 ppm and 0.0001 ppm (Dussubieux, et al. 2007:354). Ten spots measuring 100 μ m in diameter were ablated on a freshly broken surface of each sample, and the measured values were averaged. Special care was taken to avoid temper and pore spaces, constraining the analysis to only the clay matrix. Ablation was also restricted to the center of each sherd cross-section in order to

avoid the potential bias of surface slips or edge contamination. As only a clean broken edge was required for ablation, preparation of these samples was minimal.

In total, 257 samples of ceramics were selected for analysis with LA-ICP-MS. Of this total sample, 130 were selected from the Taraco excavations, 88 were selected from surface collection samples from various sites in the Huancané-Putina survey area, 19 were from surface collections at TA-783 (identified during the Taraco-Arapa survey), 15 were from Huatacoa, four were from Machu Llacta, and one was from Machu Asillo. The core sample from the Taraco excavations consisted of *tazon*, *incensario*, and trumpet fragments excavated from Formative levels in Unit II. In some cases, convex-walled bowls (*cuencos*) and highly decorated body sherds—which could not be assigned to any of these form categories but were likely high status wares—were also selected. Analysis focused the materials from this archaeological context for two reasons. First, the excavation of this unit during the 2006 and 2007 field seasons revealed a series of unmixed Formative deposits that were ideal for analysis. Second, the unit was well stratified, and the long-term occupational sequence allowed for the monitoring of changes in patterns of manufacture over time. Several examples of fineware, including trumpets and *tazon* fragments, were also selected from Profiles I and II, which were cleaned during the 2007 field season.

Specimens for comparison with the Taraco sample were selected from the excavations at the site of Huatacoa, excavated by Amanda Cohen in 2002, and from two *pukaras* (hilltop fortresses; Machu Llacta and Machu Asillo), excavated by Elizabeth Arkush. At Huatacoa, located to the northwest in the Pukara valley, Cohen discovered one of the earliest sunken courts in the region, which dated to the 14th century BC (Cohen 2010; see Chapter 4). This site yielded significant amounts of fineware dating to the Formative Period, making it suitable for

comparison with the Taraco sample. In addition, a ceramic feline face—an ideologically charged motif that likely once decorated an *incensario* or annular base bowl—was also selected for analysis. Samples from the *pukaras* were expected to be especially useful for monitoring the movement of high status goods, as these defensive sites were probably not loci of ceramic manufacture. Ceramics were also selected from survey work in the Huancané-Putina and Arapa-Taraco regions (Figure 8.1). Although these artifacts were collected from the surface of archaeological sites, these samples provide examples of trumpets, *tazones*, and *incensarios* from many different types of sites. Analysis of these materials is critical to understanding the nature of the exchange relationship that existed among larger sites with evidence of ceremonial activities and smaller sites that did not have corporate or monumental architecture.

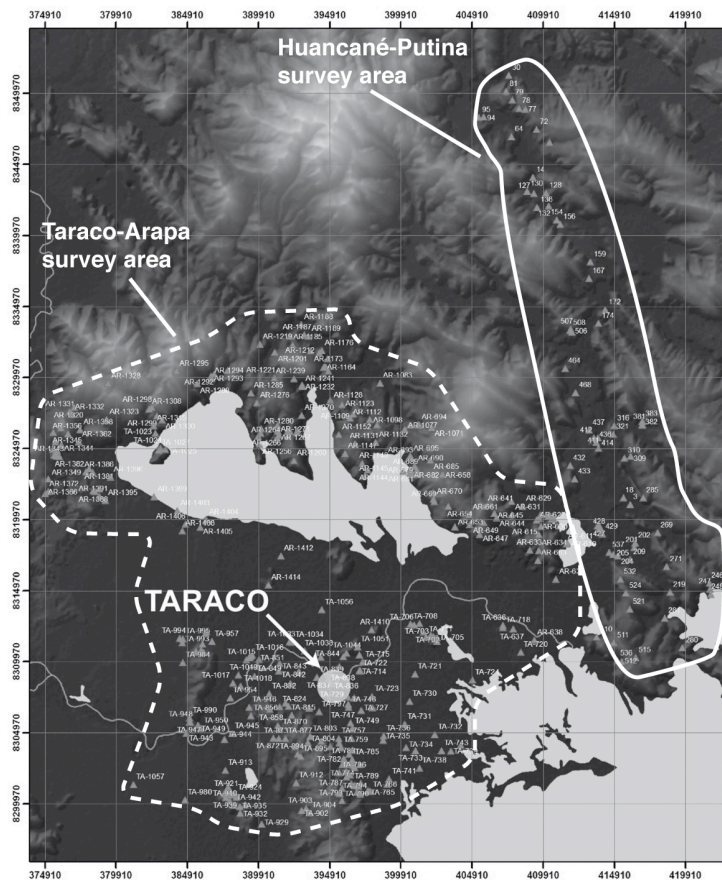


Figure 8.1. Huancané-Putina and Taraco-Arapa survey areas with Formative sites indicated (image courtesy of C. Stanish).

In addition to these samples, two standards reference materials (SRMs) from the National Institute of Standards and Technology (NIST) were also analyzed. These SRMS were run before and after each batch of five samples. NIST610 is a soda-lime-silica glass with known ratios of trace elements. NIST679, also known as “Brick Clay,” is an artificial clay with elemental concentrations that are close to most ceramic samples. A third standard, New Ohio Red Clay, was run as a quality assurance standard to monitor the performance of the instrument, and was not used to calculate sample concentrations. In addition to the certified values, Pearce, et al. (1997) provided other elemental concentrations for the glass SRM. Sharratt et al. (2009) discuss the analytical precision for ICP-MS analysis of New Ohio Red Clay at the EAF.

The procedure used for converting raw signal strength to actual elemental concentrations is outlined by Golitko (2010), but is essentially that first proposed by Gratuze et al. (2001), and later modified by Speakman and Neff (2005). Concentration values were calculated by first subtracting a blank value and dividing each of the elemental signals by the corresponding value for ^{29}Si , which was used as an internal standard to control for time variation in ablation efficiency. Once standardized, any extreme outlier values were removed before the final average signal strength was calculated. A least-squares fit regression line, derived from the ^{29}Si normalized SRMs, was then used to calculate actual elemental concentrations. Silica-normalized signals for the sample population were compared to this regression line, summing all values to 100% in order to convert from silica-normalized relative concentrations to oxide weight percentages. These were then converted to ppm concentrations using multipliers for assumed most abundant oxides present in the samples. Elements that were not measured were assumed to be of such low abundance (totaling only a few ppm or less) that they would have no significant impact on the final calculated values. Due to low instrumental measurement precision, some

elements (P, Cl, As, Ag, In, Bi) were excluded from further analysis, as well as some heavy rare earth elements (Tb, Ho, Tm, Lu) that measured poorly because of high background levels.

8.2.1 Statistical Treatment of Data

The objective of the ICP-MS analysis was to identify groups or clusters of sherds (“reference groups”) that could serve as chemical representatives of production in a region or locale (Bishop et al. 1988:318-319, Bishop and Neff 1989:66). Ideally, these chemical reference groups are highly unique, deviating significantly from one another in the multivariate space defined by the measured concentrations. Such distinctive groups can be used to chart the movement of goods around a region—especially one that is geologically diverse. The definition of these groupings typically requires the use of multivariate statistical techniques that 1) help to identify likely chemical groups, 2) test the distinctiveness of these groups relative to the others, and 3) compare the unassigned samples to them. At its most basic, this treatment involves the calculation of the probability that any given specimen belongs to one group as opposed to the others (Glascok, Neff, and Vaughn 2004:100-101; Harbottle 1976:61).

In the present study, statistical analysis of the concentration values was performed by Mark Golitko of the EAF. The exact methods used for identifying the chemical groups are summarized below. First, elemental concentrations were log transformed in order to eliminate scaling bias between low and high abundance elements. Principal Components Analysis (PCA) was then performed as a means of summing patterning in the full set of measured elements onto a smaller number of variables axes. A variant of PCA, known as simultaneous R-Q mode factor analysis, was utilized—this allows for the display of both object scores and elemental

factor loadings on a single plot (Neff 1994, 2002). Initial chemical groupings were formed based on patterning evident after these steps.

These provisional chemical groupings were refined by calculation of jackknifed probabilities of group memberships as derived from Mahalanobis distance from group centroids (Golitko 2011:256). Mahalanobis distance is the squared Euclidean distance in the hyper-geometric space defined by measured elemental concentrations between a data point and the centroid of the group to which it is being compared divided by the variance of the comparison chemical group in the corresponding direction, summed over all elements. This is the multivariate equivalent of calculating the z-score for a univariate measurement, and accounts for both the position of a sample sherd relative to other samples in a given chemical grouping, as well as the hyper-geometric shape of the group in question. Membership probabilities themselves were calculated using Hotelling's T-test, the multivariate version of Student's t-test. When comparing the statistical separation of potential reference groups, so-called "jackknifed" probabilities are calculated for samples relative to the groups they are initially placed in. Jackknifing refers to removing each sherd included in a postulated group in turn, recalculating the group mean and standard deviation, and then calculating the corresponding membership probability. This step prevents sherds that should not be assigned to a particular group from stretching its statistical boundaries, resulting in erroneous assignments (Golitko 2011).

Calculation of Mahalanobis distance is a matrix operation performed using the variance-covariance matrix of the chemical group to which a sherd is being compared, and calculation requires that this matrix have a minimum of two more rows (objects included in the chemical group) than columns (elements or variables used to define the chemical group). Although principal components scores can be used instead of elemental concentrations to reduce the

number of variables included in the calculation, rigorous statistical testing of small chemical groups is nonetheless difficult. The multivariate statistical “size” of a chemical group may be significantly overestimated when there are less than three to five times as many samples as variables, resulting in overestimated probabilities of membership (Harbottle 1976; Neff 2002).

Canonical Discriminant Function Analysis (CDA) was a further test of multivariate group separation employed in this study. This technique determines axes of maximum variation among the groups defined by the analyst—new scores for each sherd relative to the new discriminant function are then calculated. An additional function axis is required for each additional group included, meaning that there will be one fewer new variable axis defined than groups included in the analysis. Ungrouped sherds can then have scores calculated relative to these functions, and be compared to the predefined chemical groupings (Baxter 1994).

8.2.2 Results

Golitko’s initial inspection of the bivariate plots (see Figures 8.2, 8.3, 8.4, and 8.5) found that the majority of analyzed sherds fall into a single large chemical group. Jackknifed Mahalanobis distance based probabilities of group membership were therefore calculated relative to the entire dataset in order to identify outliers (specimens falling below 1% membership probability) that did not fall into this chemical group. Outliers were removed at each iteration, and the process was repeated until a single coherent group, termed Group 1, resulted. The same process (bivariate plots and cluster diagrams) was utilized to examine the remaining data points, resulting in the identification of seven additional chemical groups (Groups 2-8). The size of these groups varied considerably, ranging from three (Group 4) to 30 (Group 5) specimens. The small size of some groups precluded their testing in an analogous manner to Group 1 (that is, to have group

membership probabilities calculated relative to them, e.g., Vaughn and Neff 2000); however, CDA with the eight groups as input clearly separates all eight from one another. A Wilk's λ test (a ratio between summed within-group variance and summed between groups variance) demonstrates that these chemical groups are significantly different from one another at greater than the 0.000005 level ($\lambda < 0.0000$, $F = 14.1818$, $p < 0.0000$).

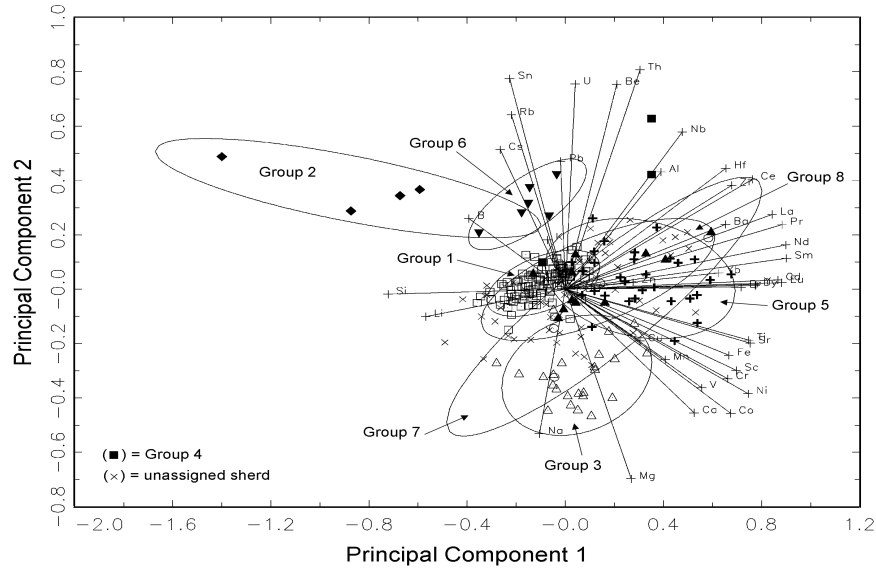


Figure 8.2. Principal components bi-plot (calculated from the correlation matrix) showing principal chemical patterning and identified chemical groups.

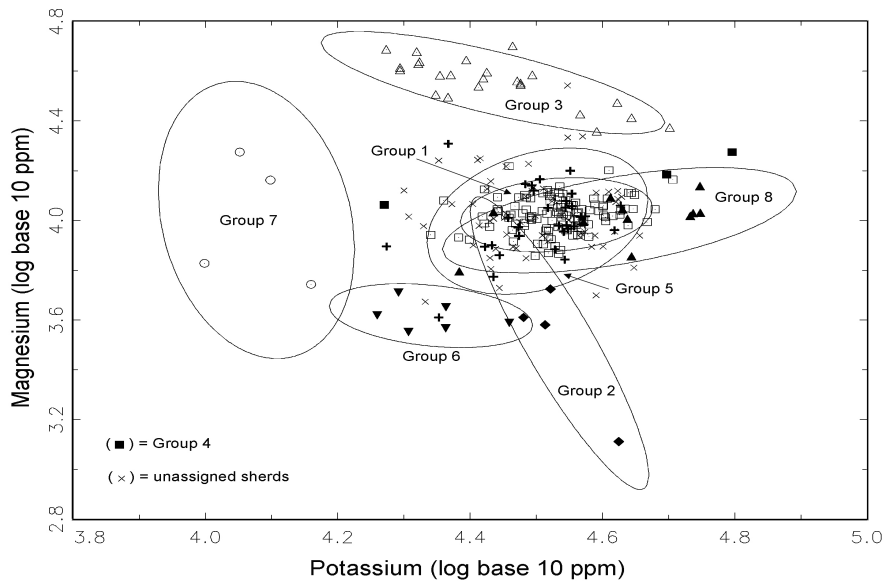


Figure 8.3. Bivariate K-Mg (log base 10 ppm) plot showing chemical distinctiveness of chemical groups 2, 3, 6 and 7.

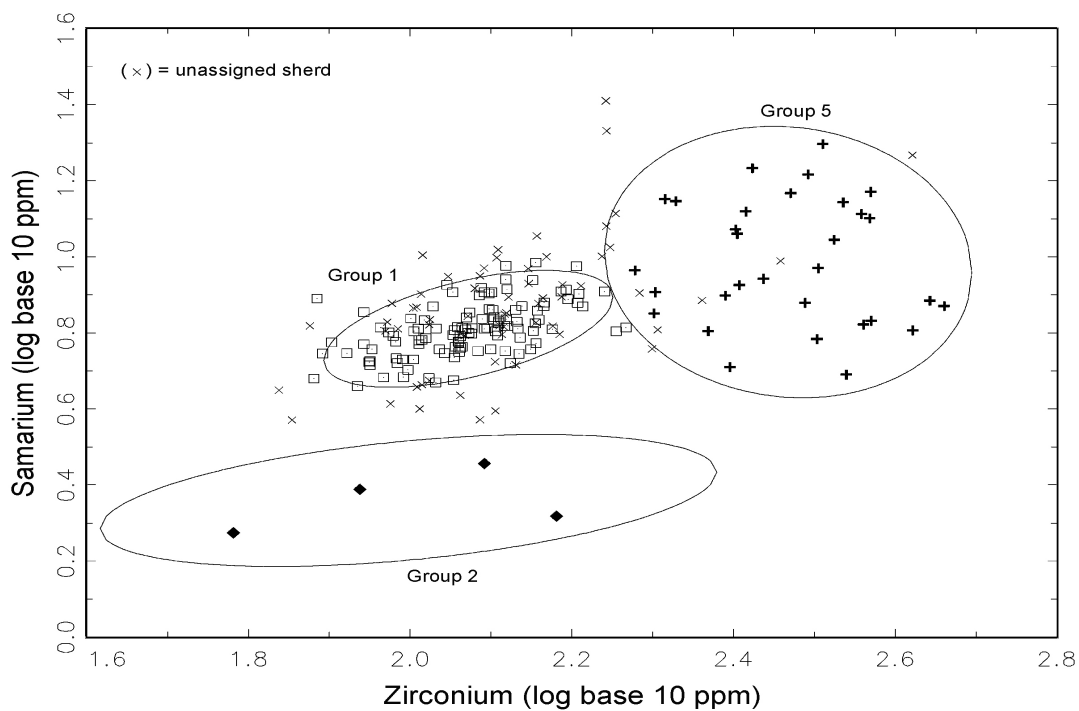


Figure 8.4. Bivariate Zr-Sm (log base 10 ppm) plot showing distinction between chemical groups 1, 2, and 5.

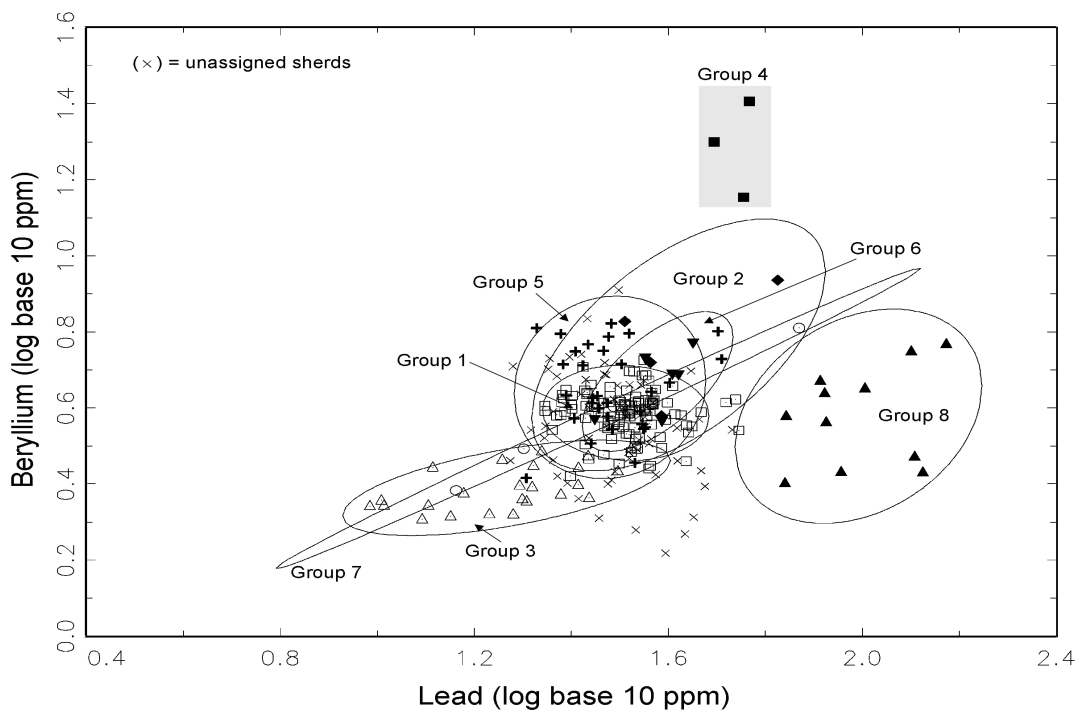


Figure 8.5. Bivariate Pb-Be plot (log base 10 ppm) showing distinctiveness of chemical groups 4 and 8.

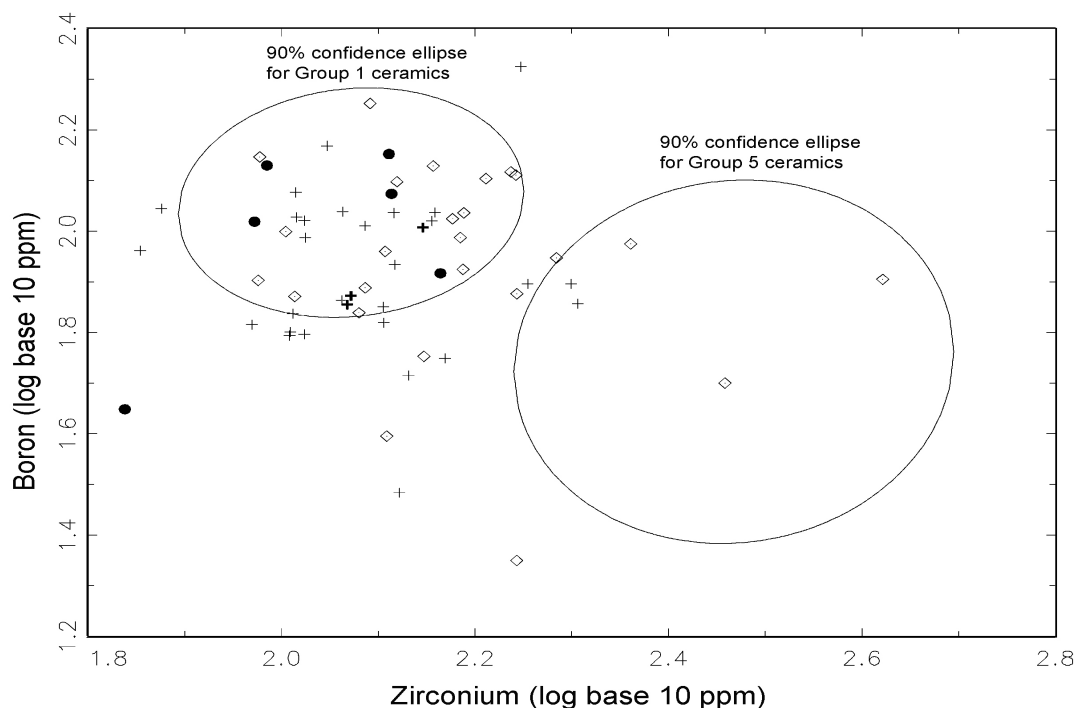


Figure 8.6. Bivariate Zr-B (log base 10 ppm) plot showing association of unassigned samples with chemical groups 1 and 5. (+) = unassigned sherds from Taraco, (Bold +) = unassigned sherds from TA738, (◊) = unassigned sherds from HU survey sites, (●) = unassigned sherds from Huatacoa

Approximately 25% (63/257) of the analyzed sherds could not be assigned to any of the aforementioned eight groups. However, both visual inspection and posterior analysis based on CDA scores suggest that the majority of unassigned specimens are actually statistical outliers of the two largest identified chemical groups, Groups 1 and 5 (see Figure 8.6). Presently, suggestions as to where these sherds were produced and how they reached their final archaeological context are largely based on the “criterion of abundance,”—i.e., that chemical groups are likely to be most frequently represented near their source of production. Work by Arnold (2000), discussed in Chapter 5, substantiates this assumption. For other chemical groups—particularly those containing small numbers of sherds—it is more difficult to determine an origin. The eight chemical groups are described below.

Group 1

Group 1 is the largest group (112 assigned samples) identified, and is found in at the highest frequencies at the site of Taraco and the nearby TA-783, but is also present in nearly all of the sampled areas. Samples belonging to Group 1 are characterized by intermediate elemental concentrations relative to the other chemical groups for most elements, but relatively low Al content, as well as high concentrations of Cs, Sn, Rb, Si, K, and B. Low K/Rb content is suggestive of production using Illite poor clays.

Group 2

Group 2 consists of only four specimens, which are characterized by elevated Si, Sn, Li, Th content, and very depleted concentrations of many transition metals and all rare earth elements, as well as some alkali elements (Ca, Sr, and Ba). Two of the Group 2 samples were recovered from the Taraco excavations, while the others were collected from two sites in the Huancané-Putina survey area (HU-310 and HU-507).

Group 3

Group 3 contains 24 sherds, and while the bulk of the specimens (75%) had been recovered from Taraco, this group was also identified for sherds from Huatacoa, Machu Asillo, and the Huancané-Putina survey area. Sherds in Group 3 are characterized by relatively high levels of Mg, with elevated transition metal concentrations to a lesser degree, and low Rb, Cs, Th, Be, Sn, and Rare Earth Element (REE) concentrations.

Group 4

Group 4 is the smallest of the identified chemical groups, consisting of only three members from Huatacoa, Machu Asillo, and one site from the Huancané-Putina survey area (HU-30). These sherds are characterized by very high Be content, and to a lesser degree, by elevated levels of Zr, Hf, Th, and U, suggesting high content of mineral zircon grains.

Group 5

Group 5, containing 30 specimens, is the second largest chemical group identified for the study sample. This group is primarily associated with sites in the Huancané-Putina survey area, but was also found among the materials from Taraco and TA-783. Sherds in this group are distinguished by their high Zr and Hf concentrations, but lack the elevated Th and U levels of Group 4. This finding indicates that these sherds likely derive from a different basic source geology than those from Group 4. Also characteristic of this group are relatively high concentrations of Ba, Sr, and Ni, and low concentrations of Si, Li, B and Cs.

Group 6

The six samples in Group 6 all derive from four sites in the Huancané-Putina survey area. These sherds are characterized by high Al, Sn, Th, and U content, and low concentrations of Heavy REE, Co, Fe, Na, V, Mg, K, Sc, and Cr.

Group 7

Group 7 contains four sherds from Machu Llacta, Taraco, and HU-406, located in the Huancané-Putina survey area. Members this group are characterized by particularly low levels of K, Rb,

Cs, and B, as well as elevated Al content. This is indicative of production from kaolinite rich clays with low illite content.

Group 8

Group 8 contains 11 sherds that are characterized by high Pb content. These sherds were primarily recovered from Huatacoa and in the Huancané-Putina survey area, but small numbers were also found at Taraco and TA-783.

The distribution of these ICP groups across sites strongly suggests that Group 1 and Group 3 sherds were produced at or near Taraco and TA-783, while Group 5 is heavily associated with sites in the Huancané-Putina survey area further east (see Table 8.1). Group 6 is also only found among the sherds collected from sites in the Huancané-Putina survey area; however the small size of this group (N = 6) precludes the determination of a potential source area with any degree of certainty. Other chemical groups are more difficult to interpret from a purely geographical standpoint, as they contain fewer sherds and are more evenly distributed across sites in the study. Taraco sits on an alluvial plain draining out of primarily Plio-Pleistocene geology, a possible candidate for sources of clays used to produce chemical Group 1 ceramics. Sites in the Huancané-Putina area are primarily located in alluvial valleys within predominately Cretaceous age geology. Huatacoa and Machu Asillo are located further northwest in an area of very mixed geology, with both Cretaceous rocks as well as younger Miocene-Oligocene volcanic formations.

Region/Group	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Unassigned	Total
Huancané-Putina	23	2	3	1	24	6	1	3	25	88
Huatacoa	1	0	2	1	0	0	0	5	6	15
Machu Asillo	0	0	0	1	0	0	0	0	0	1
Machu Lacta	0	0	1	0	0	0	2	0	1	4
Taraco/TA-783	88	2	18	0	6	0	1	3	31	149
Huancané-Putina	20.5%	50.0%	12.5%	33.3%	80.0%	100.0%	25.0%	27.3%		
Huatacoa	0.9%	0%	8.3%	33.3%	0%	0%	0%	45.5%		
Machu Asillo	0%	0%	0%	33.3%	0%	0%	0%	0%		
Machu Lacta	0%	0%	4.2%	0%	0%	0%	50.0%	0%		
Taraco/TA-783	78.6%	50.0%	75.0%	0%	20.0%	0%	25.0%	27.3%		

Table 8.1. Distribution of ICP groups by site area

Some strong patterning is evident in these data. The Taraco sample is dominated by members of ICP Groups 1 and 3, which, together, constitute 90% (N = 92) of the assigned specimens. The remaining 10% (N = 10) of the sample includes sherds belonging to Groups 2, 5, 7, and 8. However, these groups are not evenly distributed across the three occupational phases—Groups 2, 5, and 7 are only found in Phase 3 (Figure 8.7). Moreover, only a single sherd belonging to Group 8 (a fragment of a Tazon B7) was discovered in the Phase 2 assemblage, which was principally composed (94%) of specimens from Groups 1 and 3.

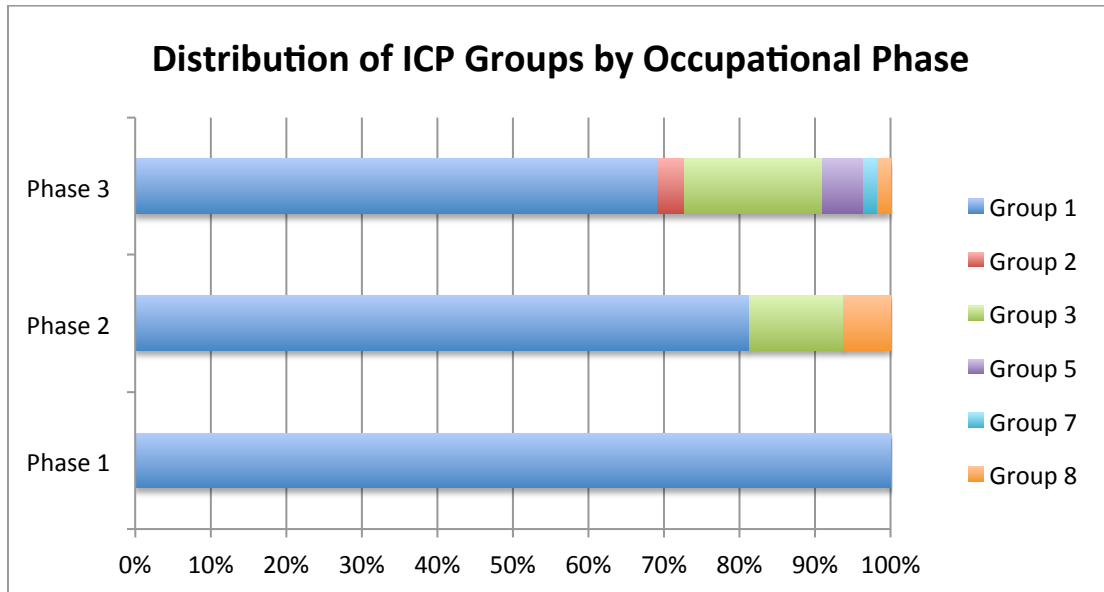


Figure 8.7

Though the appearance of these other groups could be due to the relatively larger size of the Phase 3 sample, their presence nevertheless has implications for production and distribution of ceramic finewares in the north Basin. Following the work of Costin (1991:33), and Vaughn (Vaughn 2000; Vaughn, et al. 2006; Vaughn and Neff 2000), the increased variability in source material evident in the Phase 3 assemblage likely corresponds with increased numbers of producers involved in the manufacture of these goods. Given the high quality of clay sources

that were locally available, and that the overwhelming majority of Taraco ceramics analyzed were produced using a very limited array of source material, I argue that it is unlikely that local potters were venturing far from their territories to mine clay for the production of such a small fraction of their output.³³ Rather, I suggest it is far likelier that these “foreign” clay sources were introduced into the Taraco sample as finished products via trade activity. As ceramics are fragile objects, and do not have the durability of lithic materials—which were transported over hundreds of kilometers (Braum, et al. 2010; Williams, et al. 2009)—it is logical that large quantities of pottery were not circulated over the vast *altiplano* landscape. These results suggest an intensification of trade in elite finewares, and presumably other types of items, during the early Pukara period.

The percentage of “non-local” materials identified in the Phase 3 sample is consistent with low levels of exchange that would be expected if these objects were not regularly traded, but were instead perhaps exchanged as part of reciprocal exchange agreements, or as tokens of affiliation during faction building activities. This idea is substantiated by the distribution of chemical groups in the sample of trumpets and *incensarios*, non-domestic finewares used only in rituals and ceremonies. All but two of the trumpets and *incensarios* from Taraco (N = 22), regardless of paste type, were assigned to either Group 1 or 3. This is a strong indication that the production of these ritual objects was largely local. In addition, their low macroscopic variability (discussed in Chapter 7) also suggests manufacture by a limited number of artisans. In contrast, trumpets and *incensarios* from the Huancané-Putina survey area (N = 19) are much more variable, with seven chemical groups³⁴ identified for the comparably smaller sample. The fact that nearly half (42%) of the Huancané-Putina specimens are from ICP Groups 1 and 3 is

³³ As this study considered only the clay matrix, avoiding analysis of the non-plastic inclusions, the same cannot be said for added tempering agents.

³⁴ ICP Groups 1, 2, 3, 5, 6, 7, and 8.

significant, and is likely a result of trade with the Taraco area. The fact that ICP Group 5 was not found among the Taraco trumpets and *incensarios* suggests a one-way movement of ritual finewares between these two areas.

Another important point emerging from this analysis downplays the importance of trade as an explanation for the region-wide appearance of these important objects. While Arnold (2000:363) argues that variation in paste must be understood as variation in source material within a community's resource area, the results from the ICP-MS analysis indicate that this is not always the case, especially for certain classes of objects. On the contrary, the results of the present study suggest that, for prestige objects and finewares, paste is rarely a product of source material. In this study, the macroscopically observed paste types are not restricted any single chemical group, or even a few neighboring chemical groups. Paste group FIII:II-3 is a prime example of this observation. As noted in Chapter 7, this paste group is extremely rare, amounting to only 1% of the Taraco Formative sample of pottery. Nevertheless, it was the most ubiquitous paste group identified for *incensarios* and trumpets, a finding that both highlights the special nature of this paste group, and suggests a higher level of standardization in the manufacture of ceramics used in rituals and ceremonies relative to other forms. Such low variability in paste composition generally results from the involvement of fewer producers who were likely exploiting similar clay sources. Given the limited nature of production, the appearance of similar-looking finished products across the landscape would be an important sign of trade activity, either in raw materials or in the finished goods themselves.

However, the ICP-MS analysis of 28 artifacts from the paste group FIII:II-3 from Taraco and four other sites in the Huancané-Putina survey area indicates a different scenario. For the 19 specimens selected from Taraco, four unique clay sources were identified (ICP Groups 1, 3,

7, and 8). Four groups (ICP Groups 1, 3, 5, and 6) were identified among the nine sherds selected from the other sites. Each of the samples includes ICP Groups that were not shared by the other. The variety of sources present in the just the Taraco sample suggests that this paste group may be a product of something other than the raw material source. The fact that sites in the Huancané-Putina area utilized additional sources to achieve a similar product confirms this idea. It must also be noted that the same paste *types*—and not simply the same paste groups—are achieved using completely different sources of raw material. The data strongly suggest that both site areas were using their own local (as inferred by the criterion of abundance) sources to create pastes that are macroscopically indistinguishable.

Paste group FIII:II-3 is but one example of the general trend in the ICP-MS results suggesting that macroscopically observed paste types are not always a product of the raw materials and their natural inclusions. Rather, they reflect the choices and actions of the artisans involved in pottery production. Even though different production loci are exploiting different raw material sources, they are nevertheless producing objects with similar appearances. Scholars have repeatedly shown that people tend to imitate the behavior of successful and/or prestigious individuals; it is therefore highly likely that similar pastes may result from potters imitating one another, perhaps in attempt to make their products look “right,” or otherwise conform to a certain regionally accepted standard. In this case, a desire to conform and the process of emulation have a profound effect on the material culture. These results may also suggest a shared sense of production practice, despite the absence of specialized workshop facilities or control over manufacture. In addition, these findings beg the reconsideration of how much trade was actually taking place, and what kind of proxies we can use to successfully monitor trade, because potters made conscious choices to make their output look a certain way.

This finding does not preclude that trade in these objects—even those that share similar paste composition—was taking place, but rather introduces an additional measure of complexity to the analysis of Formative trade networks. Moreover, it does not mean that low macroscopic variability cannot correspond with fewer numbers of producers. The ICP data suggest that while most areas were producing similar-looking finewares for local consumption, some trade of these objects, specifically ceremonial wares, was taking place. However, this exchange was not reciprocal. As evidenced by regional comparison of ritual finewares, when artifacts were exchanged beyond the area where they were produced, they generally moved *from* the Taraco area *out* to other regions. In fact, only five sherds (5%) in the entire Taraco sample belong to ICP Group 5 (see Table 8.1), which is associated with the Huancané-Putina area. Importantly, these artifacts—four *tazones* and one decorated body sherd—are not specifically confined to ceremonial use, as are trumpets and *incensarios*. By contrast, 26 (41%) of assigned sherds from the Huancané-Putina were traced to ICP Groups 1 or 3. These data indicate that while Taraco did not control the *production* of finewares, it nevertheless exacted some measure of influence and/or control over their *distribution*.

Two examples that run counter to this trend are paste groups FI:I-7 and HI:II-1. Sherds (N = 16) belonging to these paste groups are *only* found in ICP Group 1. All of these sherds, except for a single specimen, were collected from Taraco and neighboring TA-783. Looking at these pastes using available regional data from the Huancané-Putina survey area (Chávez 2008a), this finding seems to be the example, rather than the exception; members of paste group FI:I-7 are all but absent from the Huancané-Putina sample, and members of group HI:II-1 are only marginally better represented. The fact that these sherds all belong to a single chemical group,

and that these paste groups are only found in this fairly restricted geographic area, substantiates the hypothesis that ICP Group 1 was produced in or around the Taraco site area.

8.3 Obsidian

Obsidian was present in all occupational phases at Taraco, and a sample of the obsidian recovered from Unit II was selected for analysis. This sample, composed of 76 artifacts, stands in marked contrast to assemblages recovered from Formative centers in the southern Basin both in volume and character. The total weight of this assemblage is 155.4 g; this figure is nearly double the total amount of obsidian (87.1 g) recovered by the Taraco Archaeological Project (TAP) in four seasons of excavation at Chiripa (Bandy 2001, 2005; Hastorf 1999). Moreover, only two artifacts from this sample could be identified as finished bifaces; all other specimens were classified either as debitage or as retouched flakes, although notably, no cores were found. In contrast, Chiripa excavations yielded a predominance of bifaces, but only a very small amount of debitage, a pattern that suggests residents were acquiring their obsidian in the form of finished points (Melson 2010; Perlès, et al. 2011; Seddon 1994). Data from Area A, in contrast, indicate that Taraco was likely a locus of tool manufacture (Blomster and Glascock 2011), and almost certainly a preliminary node in a “down-the-line” exchange network (Renfrew 1975, 1977) from a very early stage in the occupation of the site. Finished bifaces were redistributed, most likely to allies or other supporters, and the large flakes, immeasurably useful for household tasks such as cutting or slicing, remained at the site.

Geochemical characterization of a randomly selected subsample of 58 of these artifacts was performed using portable x-ray fluorescence spectrometry (Craig, et al. 2007), a non-destructive method for *in situ* compositional analysis. Results indicated that all materials had

been quarried from the Chivay source in the Colca Valley (Burger, et al. 1998; Glascock, et al. 2007), near Arequipa, with the exception of one artifact, which was traced to the Alca source (Glascock, et al. 2007; Jennings and Glascock 2002). This piece of debitage was recovered from the floor of Structure UII-1 (Feature UII-11), and dated to the Phase 3 occupation. The abundance of Chivay obsidian is consistent with previous compositional studies in the Titicaca region (Aldenderfer 1999; Burger, et al. 2000; Craig et al. 2007). These results indicate the persistence of regular trade routes, as well as a long-distance trade relationship, dating back to the earliest occupation of the settlement.

Looking at the temporal distribution these obsidian artifacts alongside analogous, non-obsidian tools provides a useful lens for understanding residents' preference for—as well as access to—different material types. Table 8.2 shows counts and weights for obsidian versus non-obsidian (usually chert, but also rhyolite, basalt, andesite, and quartz) flaked tools for the three Formative occupational phases, as well as post-Formative (Huaña) activity surface. Considering only flaked tools and debitage restricts the sample to analogous tool types and permits effective comparison of material types; *azadones* (hoes/adzes) and other groundstone artifacts were excluded from this analysis because they represent a distinct class of tools, and, as such, were not suitable for comparison. These data indicate significant patterning in the lithic assemblages of the three occupational phases. In the Phase 1 sample, 71% of flaked tools are manufactured from materials other than obsidian. A complete reversal in this trend is seen in Phase 2 with a nearly threefold increase in the frequency of obsidian relative to other materials ($X^2 = 7.08, p = 0.008$). By Phase 3 there is essentially a glut of obsidian, with 82% of the flaked tools made of this exotic import.

The implications of the temporal distribution of raw materials are profound. While

obsidian is present in the earliest phases, there is greater usage of locally available raw materials, which are of high quality (in terms of their usefulness for tool making) and relatively cheaper (in terms of their ease of acquisition). During the late Middle and early Upper Formative, obsidian continues to be imported with ever increasing quantities such that by Phase 3, there is a clear preference for this material over other equally useful, locally available alternatives. The Phase 3 supply of obsidian is so plentiful, in fact, that waste—as indexed by the size and the abundance of debitage (Surovell 2003)—is rampant.

People of Area A did not maintain this level of access indefinitely, however. Two lines of evidence indicate a dramatic change in the obsidian industry following the site-wide burn event. Firstly, there is simply more obsidian in the pre-burn contexts, and this is not simply a product of sample size. For flaked tools and lithic debitage,³⁵ there is a shift in the relative abundance of obsidian versus non-obsidian (chert, quartz, etc.) artifacts from the pre-burn occupation to the post-burn occupation. In the immediately pre-burn (Formative Phase 3) assemblage of flaked tools and debitage from Unit II, obsidian artifacts constituted 82% of the total sample. However, the post-burn sample of similar artifacts was found to contain only 44% obsidian. This steep drop in the abundance of obsidian is highly significant ($X^2 = 11.22, p = 0.0008$).

Second, the obsidian artifacts (flaked tools, points, and debitage) are also, on average, larger in the pre-burn sample. In fact, the mean weight of pre-burn obsidian artifacts is nearly double (2.26 g) that of the post-burn (1.318 g). When compared using a Mann-Whitney U-Test, the differences in these means was found to be highly significant ($p = 0.01168$). As the production of obsidian tools is a reductive process, the size of the artifacts—particularly of the

³⁵ As with the previous analysis, only analogous tool-types were considered here; other tool types, including groundstone artifacts (hoes, grinding stones, polishers etc.) were excluded from this analysis because they represent a distinct class of tools, and, as such, were not suitable for comparison.

debitage—may be considered as a proxy for primary access, as people tend to waste more when raw materials are plentiful (Surovell 2003). As a relative index of access patterns, this shift in mean artifact size may indicate that residents of Area A had greater access to obsidian prior to the burn than in subsequent occupations. Alternatively, the reduction in mean artifact size following the burn event could indicate the recycling of old materials by residents because their access to new raw material was curtailed or was being restricted in some way. Such practices would also result in smaller-sized artifacts anddebitage.

Occupational Phase	Context	Level	Obsidian (count)	Obsidian (weight; g)	Other stone types (count)	Other stone types (weight; g)
Huaña (Activity Surface 2)	UII-VI	9	11	14.5	14	41.5
	Totals	9	11	14.5	14	41.5
Formative Phase 3	UII-XI	17	5	6.5	-	-
		16*	12	15	-	-
	UII-XII	18	6	19.7	-	-
		19	5	7.3	1	4.2
	UII-XIII	17*	4	7	-	-
		20	5	10.6	-	-
	UII-XIV	21	3	6	-	-
		18*	-	-	1	2.5
	Fea UII-11	23	2	7.9	-	-
		18*	-	-	-	-
	Fea UII-12	23	-	-	-	-
		24	-	-	1	1.1
	Fea UII-12	25	1	2.3	2	22.7
		24	2	4.6	2	10.7
		29	-	-	-	-
		30	2	8.9	1	4
		31	-	-	-	-
		32	2	2.9	2	7.3
		33	4	7.3	2	5.2
		34	1	3.7	-	-
34**	1	1.1	-	-		
Totals			55	110.8	12	57.7
Formative Phase 2	UII-XVA	27	2	10.6	2	23.7
		28	7	15	-	-
		29	3	4.1	-	-
	UII-XVB	30	-	-	1	3.3
		31	-	-	-	-
		32	1	1.9	-	-
		33A	-	-	1	1
	Fea UII-14	-	2	1.2	1	2.6
Totals			15	32.8	5	30.6
Formative Phase 1	UII-XVI	33B	-	-	1	8.7
		34B	-	-	-	-
	UII-XVII	34A	4	8.1	4	24.7
		35	1	0.6	2	3
	UII-XVIII	36	-	-	5	23.7
		37	-	-	1	14.1
UII-XIX	38	1	3.1	2	7.1	
Totals			6	11.8	15	81.3

Table 8.2. Counts and weights for obsidian and non-obsidian flaked tools and debitage. (*) = contexts excavated during 2007 field season; (**) = elevations greater than 322 cm below Datum 1.

CHAPTER 9: EVALUATING THE EMERGENCE OF A REGIONAL CENTER

9.1 Introduction

In the northern Titicaca area, the emergence of regional centers and the development of increasingly complex social and political entities can be linked to several factors. In the northern Basin, the Formative period was characterized by the strategic participation in long-distance trade networks, rituals, and alliances, within a greater context of resource optimization, competition, and ultimately, violent conflict. In general terms, more than anything else, the Formative in the north Basin was marked by the interaction of the various political entities scattered across the region. This is most clearly evident in the settlement pattern, which would have facilitated transportation and communication among communities in the region. Analysis of the Formative (both Middle and Upper) settlement pattern in the Huancané-Putina region revealed a preference for site location at the base or along the side of hills (54% of sites), and on the pampa (38% of sites) near the river. Both of these locations would have provided access to the rivers and wet areas, but were also close to the road that runs up and down the valley.

Relatively few (only 8%) sites were located around the shore of the lake, reinforcing the observation that a location near roads was a significant determinant in the placement of settlements (Plourde 2006:445-446). Analysis of settlement patterns in the Pukara valley (Cohen 2010), to the west, as well as in the Arapa, Taraco, Huancané, and Putina regions also show a strong correlation between the most productive land (as indicated by relict raised fields and the availability of fresh water) and the placement of Middle and Upper Formative period settlements. In these other regions, sites were likewise preferentially located near roads. This relationship was supported by an agent-based model of Titicaca Basin settlement dynamics conducted by Art Griffin and Charles Stanish (2007).

By the beginning of the Upper Formative, Taraco was a major ceremonial and economic central place with access to a variety of exotic materials and prestige goods. Excavations yielded evidence of long-distance trade, feasting, supra-household food sharing, and ceremonial activities. Comparison with other similar contexts from around the northern Basin highlights the level of wealth that was concentrated in the Taraco area during the Formative. At Cachichupa, for example, Plourde found that a domestic complex adjacent to a sunken court contained only a very small amount of Qaluyu fineware, even though fragments of pottery in this style was found in other areas of the site (Plourde 2006). In contrast, the contemporaneous³⁶ domestic architecture of Area A was associated with many more examples of Qaluyu style wide-line incised and red-brown on cream pottery (Chávez 2007, 2008b). The disparity in the distribution of finewares at these two contemporary sites suggests unequal access patterns that may reflect a status differential between the two sites. While this is only one example, it nevertheless highlights the status of Taraco in regional context.

³⁶ Contemporaneity was established based on available radiocarbon dates from both sites.

9.2 Cooperative strategies

9.2.1 Trade

New data from Taraco indicate that the ascendance of the site to regional preeminence is strongly linked to residents' strategic participation in local and long-distance exchange networks. In order to fully understand the relevance of these two processes to the emergence of regional centers, it is necessary to return to ideas first discussed in Chapter 2. Simply stated, trade is not merely just the physical exchange of goods, and not all forms of exchange are the same. While the participation in long-distance trade in prestige goods allows for the accumulation of durable wealth, it is through the participation in the local exchange networks that social capital is accrued. The ultimate success of a regional center is contingent on the relationships built through local trade—good relationships with neighboring communities are effectively what make a center powerful. However, these centers need durable wealth, procured through long-distance networks, in order to underwrite the types of activities that foster alliance building at the local level.

The data from Taraco highlight a number of patterns in which goods were exchanged during the Formative Period. Long-distance networks served to import valued exotic goods. Of these imports, obsidian was likely among the most valuable or desirable. During the first century AD, Taraco had primary access to at least some of these resources, redistributing finished products, such as projectile points, to other communities. Other goods such as high-status ceramics, in contrast, were generally produced locally, but were given away on occasion, likely as symbolic gestures to allies and supporters, as they also locally manufactured fineware. Such gifts effectively served to materialize otherwise intangible relationships. Though there is no

evidence for direct control over production of these objects at this time, Taraco appears to be the only site involved in the *distribution* of ritual finewares. As these objects were not reciprocally exchanged, they not only served as tokens of affiliation, but also likely contributed to unequal power relations in the region.

These results also indicate the persistence of long-distance trade relationships that persisted from the earliest occupational phases of the site. Based on the excavation data, I suggest that this relationship may have stemmed from Taraco's status as a "transit community" (Bandy 2005) during the Middle Formative. Such strategically located communities occupy—or come to occupy—territory through which traded goods must pass, and play a significant role in trade systems in decentralized political contexts (Northrup 1978). It is no surprise that the transportation of goods, and especially highly valued exotic commodities, was a risky endeavor, as traders present easy targets for pirates or opportunistic bandits. Successful expeditions would have required traders to cultivate relationships with the people living along their regular routes, relationships that were maintained across generations through marriage alliances and gift-giving (Bandy 2005). In the absence of a region-wide force responsible for safeguarding trading expeditions, transit communities, ensuring the safe passage of goods, would have served an essential function in the regional economy. Security seems to have been a legitimate concern for early residents of the north Basin; the Middle Formative settlement pattern of the upper Huancané-Putina Valley in fact suggests that travel through the area—possibly through hostile territory—was the purpose of settlement in this part of the region (Plourde 2006:485). During the earliest phases of the occupational sequence at Taraco, individual households likely offered a safe haven to traders, providing lodging and food in exchange for presents of exotic goods—in this case, obsidian. The large size and elaborate decoration of the serving vessels in the earliest

occupational contexts lend credence to this hypothesis, as these would have been used for small, household-based gatherings where food was shared family-style.

Geochemical characterization of randomly selected obsidian artifacts revealed a sample almost exclusively composed of Chivay material. This is a significant difference from the finds of Burger and colleagues, who identified 16% (N = 58) Alca obsidian in the pre-Pukara levels at Taraco excavated by S. and K. Chávez. As these excavations were conducted within 100 m of the current excavation area, it is possible that this differential distribution of source material may reflect differentiation among Taraco's elite residences. It is likely that trade relationships were not maintained at the community level, but rather, different groups had their own access to sources. Based upon analogies with ethnohistoric data, these groups were probably responsible for the maintenance of their own long-distance networks. While more data are needed to support this hypothesis, this scenario is consistent with other well-documented cases of long-distance trade, such as the Trobriand Islander *kula* ring (Malinowski 1961 [1922]), and could explain this kind of variation in source material within such a small area.

By intensifying their participation in these long-distance networks, residents of Area A were able to accumulate the durable resources required for local faction building and political expansion. A reciprocal relationship with passing traders would allow these hosts to accrue wealth and concentrate exotics faster than their neighbors, thereby providing an important mechanism for rapid socio-economic differentiation both within and among communities. Ultimately, the imported wealth was used to finance a budding political economy, which would have included new forms of public ceremonialism that featured music (trumpets and pan-pipes), the burning of incense, and community-sponsored feasts. During these events, followers would be allowed access to exotic imports, and social bonds were materialized with gifts of high-status

crafted goods. Such events provided a context for status competition and alliance negotiation, and likely served as a venue for local trade and other types of social activities. In other words, this wealth allowed the early residents of Taraco to “buy into” and later create and disseminate regional ideologies, including the Yaya-Mama religious tradition. By the first century A.D., these strategies successfully attracted populations from around the northern Basin. The documented exchange of high-status goods between Taraco and Pukara represents a form of cooperation that may have been complementary with their competition; after all, in order to compete effectively, “aggrandizers require the cooperation and support of indebted clients, probably including many kin, and other patrons or trade partners” (Clark and Blake 1994:19).

The shift from the household-based hosting of important guests to larger-scale public food sharing and feasting is manifest in the results of the ceramic analysis. Specifically, the increased abundance of smaller, undecorated bowls during the third phase of the Formative occupation points to a significant change in modes of supra-household food consumption. This is an important shift from earlier phases, which were characterized by the presence of extremely large, elaborately decorated serving wares. As discussed in Chapter 7, this pattern is similar to that identified by Steadman (2007) at the site of Kala Uyuni. In her analysis of the ceramics from this site, she documented the presence of very large bowls for the Late Chiripa phase; these disappear during the subsequent LF1 phase and are seemingly replaced by smaller-sized vessels. Bandy suggests that these changes in the serving assemblage reflect a “reconfiguration of commensality” that involved a shift from communal “pot-luck” style food sharing events to more public events in which participants were served in individually owned vessels (Bandy 2007:141). This new style of feasting, described by Bandy as “one-to-many,” represents a shift to a more defined status of “host” and represents one of the various ways that leaders could develop their

political economy, thereby attracting followers, promoting cooperation, and enhancing the growth of their community.

9.2.2 Shifts in Subsistence

Other data speak to an increased emphasis on inclusive political strategies during the early part of the Upper Formative. Analysis of the storage assemblage suggests that during the Phase 3 occupation there was an increase in both the amount of storage, as well as in the diversity of materials that were being stored. The documented shift in the domestic storage assemblage likely reflects a greater availability of surplus foodstuffs—the foundation of supra-household food-sharing events. Regardless of whether the sudden increase in the availability of surplus was a result of ecological or anthropogenic factors, the Phase 3 storage assemblage reflects a newfound emphasis on the preservation of excess food. Such an interpretation implies increased supra-household food consumption and that residents were actively planning and preparing for these periodic gatherings. Analysis of the storage wares also suggests a move towards a more complex—and likely more labor intensive—cuisine during Phase 3. This phase witnessed the introduction of two new size categories into the storage assemblage—*cantaros* and *botellas*—both of which may indicate additional processing steps, new preparation techniques, or longer lists of ingredients. Another possibility is that the consumption of certain kinds of foods was being intensified. The presence of *cantaros* may also point to the preparation, storage, and transport of liquids or beverages, such as *chicha*, the consumption of which is vital to all types of social events throughout the Andes. These new modes of food preparation would have emphasized the special nature of food-sharing events.

Other changes in food preparation likely fulfilled the secondary purposes of efficiently serving of large numbers of people. The increase in the abundance of necked cooking vessels during the Phase 3 occupation suggests an increase in the preparation and consumption of boiled or fermented liquid foods, such as soups, stews or brews, and less of a reliance on frying or simmering. Such foodstuffs are ideal for serving large groups for several reasons. First, once the meal is cooked, the food can be kept ready, and people can be served at any time. This would have been useful when serving guests with unpredictable arrival times, or during special events, when large numbers of participants would have prolonged serving time (so that those last served would not be presented with cold or overcooked food). Secondly, preparing soups and stews aids in the equitable distribution of nutrients among participants, as the boiling process ensures that the some of the nutrient value of scarce or expensive ingredients is present in every serving. Also, the watery nature of liquid foods allows for the extending of ingredients; raw materials can be “stretched” to feed larger numbers of people (Smith 2010). Hosts do not have to turn away unexpected guests due to lack of ingredients—the addition of water to the pot, while thinning the final product, means that more people can partake in the meal. This advantage likely became especially important as food-sharing and feasting events became key methods of building and maintaining social ties, both at the household and the community levels.

Shifts in cooking techniques might have also allowed residents more time for other types of activities. Liquid foods are also relatively efficient modes of production and consumption, and their preparation involves task sequences that are highly suited to multitasking environments (Smith 2010). Unlike the precisely timed, linear steps required by other modes of food preparation, liquids do not need to be watched closely during preparation; soups and stews can be kept on the fire for long periods of time, or even removed and reheated, without affecting the

final product. Some consumers may even argue that extended cooking or repeated reheating actually improves the flavor of the final product. The forgiving nature of liquid foods affords a certain measure of freedom versus other cooking techniques, and may permit involvement in other household-based activities, such as craft production. This flexibility would have also been extremely valuable as Taraco expanded its political economy, a process that likely required shifts in the organization of household labor.

9.3 Competitive strategies

9.3.1 Conflict

The data from Taraco indicate that competition among Formative populations involved not only inclusive, cooperative strategies, but also organized conflict and violence. While the former served to attract followers and build factions, the latter aimed to absorb and eliminate competitors. The activities at Area A produced three distinct types of burning that are visible and distinguishable in the archaeological record. While two of these were likely the products of domestic activities, the third—a site-wide burning episode—represents the earliest documented evidence for raiding in the north Basin. A review of these different types of burning highlights the unique and special nature of the burning event.

9.3.1.1 Periodic episodes of burning

During the course of excavation, excavation crews identified three distinct types of burning. The first of these includes the periodic episodes of burning associated with the occupational surfaces.

During the excavation of Unit II, we discovered that a thin layer of ash often separated floor levels from one another. This pattern was repeated in nearly all of the Formative structures uncovered during excavation, and it is important to note that in each of these instances, the evidence of fire is restricted to the floor surface area. A review of local archaeology and contemporary domestic practices presents a few likely possibilities as to the origin of these ash lenses. Ethnographically, we know that residents of the Andean highlands often cover the floors of their domiciles with mats woven of cane or *titora* grass; these mats, known locally as *estera*, are used for sleeping, sitting, or other household activities, and serve as a barrier against the cold earth below. Local informants indicated that after a period of use, the *estera* are often burned to rid the home of any garbage or pests that may have collected in the folds of the mat surface. Alternatively, when cleaning out hearths or other food preparation areas, some ash is inevitably deposited onto the floor. This ash is then stepped on, leaving a thin lens embedded in the floor surface (D. Kurin, personal communication 2010).

Another possibility is that these lenses are the products of ceremonies associated with household renewal, as has been suggested for other sites in the Titicaca area. Throughout the Andes, ritual burning continues to figure prominently in traditional religious activities. The burning of incense, animal fat, or food is used to make a *pago* (payment) to the spiritual world (Cohen 2010). Although burning is most often associated with ritual spaces (see discussion in Chapter 4), it is also a significant part of the domestic sphere, playing a vital role in household offerings and re-flooring events. At Huatacoa, Cohen identified periodic episodes of burning in the Early Qaluyu house (Area B), which she interpreted as evidence for re-flooring rituals. The house had been resurfaced several times throughout its occupation. In one of these events remains of ash and “what may represent an offering” had been deposited between the floors.

Such an activity, she argues, may have served to dedicate the house at the time of reconstruction (Cohen 2010:294).

At Chiripa, Bandy (1999, 2001) found a similar series of ash lenses during the excavation of the Lower House Level structures. He suggests that the abandonment of one floor and subsequent construction of the next was associated with a specific ritual practice that involved placing a thin layer of fill over the old floor and lighting a fire atop the fill surface. A new floor, made of clean yellow clay, was laid immediately on top of this ash deposit. Bandy found that this pattern was repeated on six of the eight floors in the sequence, and he argues that such standardized ceremonial activities served to close, or “kill,” the old floor before a new one could be constructed (Bandy 2001:127). Whether they were wholly practical or purely ceremonial—or some combination thereof—the small scale, localized burns at Taraco were likely related to periodic household maintenance and/or renewal practices.

9.3.1.2 Thermal features associated with food preparation

The second category of burning at Taraco consists of thermal features associated with food production. These features probably served as hearths, ovens, or areas of food preparation. Although these features varied in size, shape, and composition, in general, they shared some important characteristics. First, they were never located within the domestic compounds, but were always in their immediate vicinity. Second, they were usually pit features, and, regardless of their depths, they exhibited well-defined boundaries. These pits contained a dark, ashy matrix mixed with large clods of burned earth—easily identifiable by their bright red-orange color—as well as significant amounts of carbonized dung. In some instances, such as Feature PII-11, an extremely large pit stretching nearly three meters across and reaching almost two meters in

depth, these pits also contain considerable quantities of burned faunal remains and numerous charred ceramic fragments. This evidence suggests that these features served some role in the process of food preparation. Notably, this particular feature also appeared to contain the stratified refuse of several food preparation events, suggesting that it may have been a secondary deposit from ovens or hearths, but was probably not the locus of the actual cooking activities.

Upon examination, the majority of the features in this category appear consistent with pit-ovens similar to the *pachamanca* or the *watiya*, which are common modes of roasting food. These types of earth ovens are still used today in the *altiplano* to serve large groups of people, usually during agricultural fieldwork. *Pachamanca* involves digging a pit and heating stones in a nearby fire. Once they have reached their desired temperature, the stones are placed in the pit. Food—meat, potatoes, *habas*, etc., depending on the region—is layered inside with more stones and banana leaves before covering the pit, after which the food is left to roast underground for several hours (Cutright 2009). To create a *watiya*, clods of dirt and grass are stacked to create an enclosed, semi-subterranean oven in which a fire, fueled by dung, is kindled. Once the fire reaches the desired temperature, tubers are placed inside and the structure is collapsed, allowing the food to roast on the residual heat (Craig 2005; Cutright 2009; Klarich 2005).

Archaeologically, evidence of *watiyas* is not uncommon; such features have been identified by Nathan Craig at the site of Jiskairumoko in the Ilave drainage (Craig 2005), and by Katherine Moore at the site of Kala Uyuni (Moore, et al. 2007).

9.3.1.3 Site-wide burning episode

The third and final type of burning identified during the excavation of Area A was a site-wide burning episode, which was associated with Phase 3 of the Formative occupation. The end of the

Formative occupation at Area A is clearly delineated by this major burning event, which was defined by two features that repeated over a large portion of the site. The first of these were the burned roof features described in Chapter 6. As first observed during the excavation of Unit II, these roofs principally consisted of a layer of burned *paja*, the grass used to thatch the roofs, as well as burned roof beams. This layer of charred *paja* was far more substantial than the ash lenses separating the floor layers, and was far more homogenous in its texture and composition than the thermal features used in food preparation. Immediately underneath the charred *paja* there was a very fine layer of white ash, which local informants quickly identified as *paja* that had been burned at high temperatures for extended periods of time. These roofs were also capped with burned clay, or in some cases, a layer of ceramic sherds. The distinct separation of the burned clay from the charred *paja* further distinguishes the roofs from the other types of thermal features found during excavation, in which the various components were usually quite mixed.

The second defining feature of the burn event was a multicolored layer of soft soil containing ash, burned clay, pieces of carbonized organic materials, as well as architectural debris. This ashy layer—almost 50 cm thick in some places—covered the entire architectural complex of the Phase 3 Formative occupation, including walls, as well as interior and exterior floor surfaces. This layer of soil effectively entombed the early Pukara settlement at Area A.

Archaeologically, it is clear that this episode is qualitatively different from all other previous instances of site burning. Prior burns in the domestic area, the products of periodic maintenance, only targeted the surface of the prepared clay floors, and afterwards, new floors were laid down. This particular burn destroyed entire buildings, including their adobe walls, roofs, beams, and posts, across the entire site. The heat was so intense that it melted the adobe

superstructure in some areas. If this burning had accompanied abandonment of the site, then I believe that the wooden posts would have been conserved. Nine radiocarbon assays selected from multiple instances of this event substantiate this hypothesis. This analysis indicated a disparity between the ages of the beams and the *paja* used to thatch the roofs (Figure 9.1). Analysis of the six samples of charred *paja*, which was likely renewed on an annual basis, returned calendar ages that were statistically identical, even across the different excavation areas, and place the fire firmly in the first century AD. By contrast, the analysis of wood charcoal fragments returned ages for the roof beams that were much older than the *paja*, ranging from 765 to 90 BC. Moreover, unlike the *paja*, the ages of the beams were not consistent across excavation contexts. These differences in age are almost certainly due to the practice of curating large and valuable wooden beams for use in each rebuilding of a structure. This practice is unsurprising, given the rarity of suitable construction materials in the *altiplano*, an area with little conspicuous flora and high levels of solar radiation. Such conservative behaviors have been well documented in other arid and/or sparsely wooded areas around the world (Dean 1978; Schiffer 1986; Windes and Ford 1996). Beams that are centuries old are still used in houses today in the Titicaca region.

The data strongly suggest that this site-wide burn event was an episode of deliberate destruction, one that represents key evidence for raiding and is the earliest documented example of organized violence in the Titicaca region. Given the long tradition of wood preservation, it is unlikely that residents would suddenly destroy their whole community and incinerate their own beams and posts, even if they were abandoning the settlement. Additionally, the uninterrupted stratigraphy of the mound does not support a model of site abandonment. This burn event is further distinguished from the earlier instances of burning because nothing was immediately

rebuilt after the complex was burned, which would be expected if the devastating burn was accidental, perhaps ignited by a random stochastic event, or was part of periodic household maintenance, renewal, or ritual. Those burns are not site-wide, but are restricted and controlled. This scale of this conflagration would have been immense and visible from a very long distance in the *altiplano* landscape.

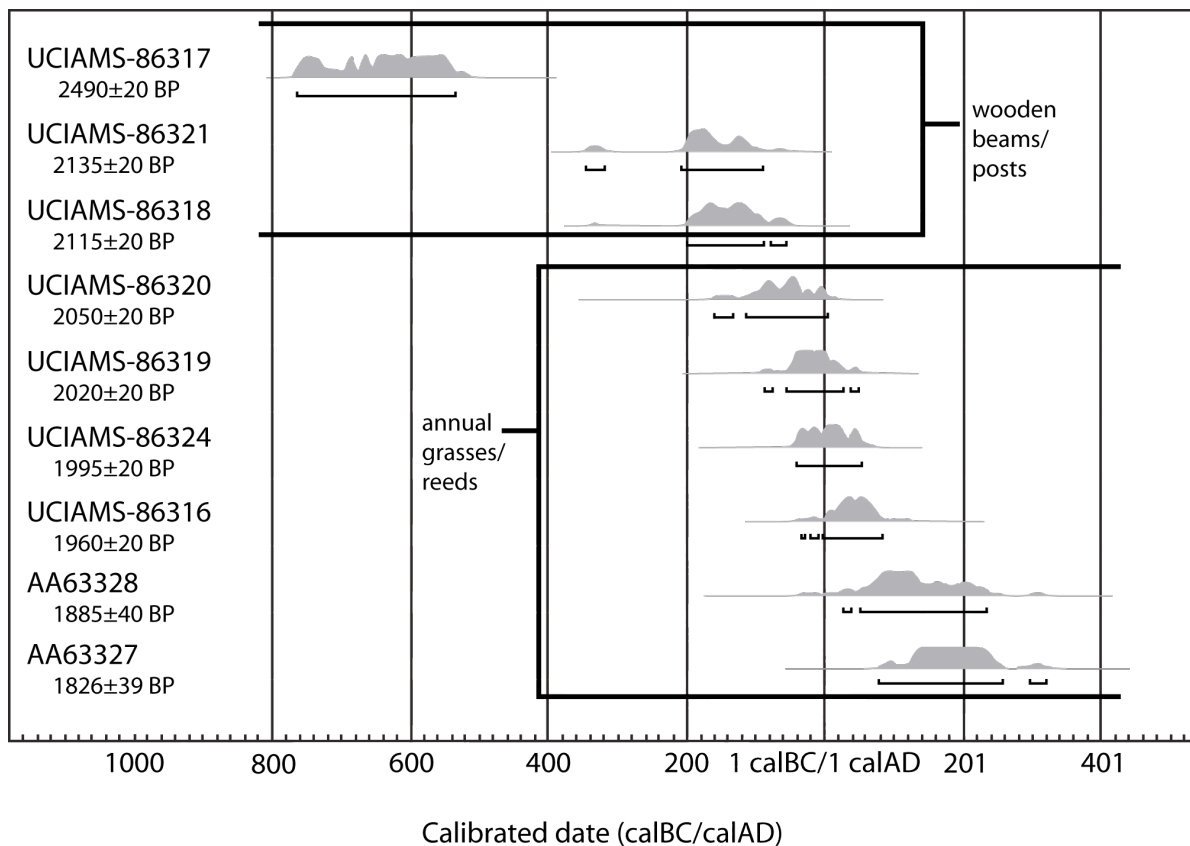


Figure 9.1. ¹⁴C dates associated with site-wide burn event with 2-σ ranges indicated

The burn marks an important change in the nature of the occupation of Area A. For over a millennium, Taraco's elites had employed a variety of strategies to elicit the cooperation of neighboring communities and attract large coalitions of supporters. Such activities enabled the site to become one of the region's earliest central places. Following the burning episode, Area A was leveled with nearly a meter of fill, and although people continued to live at the site following

its destruction, residents no longer built with fine stone or engaged in long-distance trade. The data from post-burn levels suggest an occupation of a more humble character in which residents suffered a substantial decrease in access to regional resources. These residents were agriculturalists, and while household ritual was still practiced, they had little or no use for the elaborate serving ware and ceremonial objects that had been the staples of Taraco's Formative elite. The destruction of the Phase 3 settlement essentially demarcates the end of Taraco as an aggregated political center.

These findings also highlight some important issues related to sampling in radiocarbon dating. The results from this study underscore the importance of selecting annual plants for dating purposes, rather than solely wood charcoal. Calendar ages obtained through the analysis of the roof beams are artificially old, and refer to when the tree was harvested. In the *altiplano*, this event may have occurred hundreds of years prior to archaeological deposition. Such dates are misleading for understanding the timing of past event because they do not accurately reflect the latest possible date for anthropogenic activities. This "old wood" problem, a topic of much discussion in the American Southwest and other desert environs, has not been widely recognized in the Andes. The work of TAP at Kala Uyuni is one notable exception; here, researchers have taken great pains to ensure the consistency and accuracy of their radiocarbon samples and results. TAP does not collect samples for radiocarbon dating in the field; rather, their samples are primarily selected from carbonized *Chenopodium quinoa* Wild. recovered from flotation samples. This procedure ensures the analysis of annual carbon from the same plant species that were likely gathered and used within a year of the event of interest (Whitehead 2007). Likewise, roofs in the *altiplano*, are maintained on an annual (or bi-annual) basis, a practice that makes the grasses (*Stipa ichu*, *Scripus totora*) used to thatch the roofs ideal candidates for radiocarbon

dating. Not surprisingly, these six dates from the same archaeological event were highly consistent, even though they were selected from distinct contexts. Unfortunately, if the grasses are not burned, as was the case with the Taraco samples, these thatched roofs do not preserve in archaeological context. Nevertheless, together with the TAP example, these data highlight the importance of annual plants for the implementation of a robust radiocarbon dating program, as well as documenting the exact origin of samples.

Another issue identified in this study was the number of dates in the total sample. The analysis of radiocarbon from the Taraco excavations demonstrates the importance of having a large corpus of dates. The purpose of this is twofold. First, multiple dates help to resolve any potential outlier issues. In the case of the Taraco sample of radiocarbon dates, the three dates from the beams are definite outliers, and should not be considered when assigning a calendar age to the event of interest—the burning episode. While these particular outliers represent curated artifacts (and by extension, their radiocarbon ages do not reflect the latest date of their use), erroneous dates can be caused by a myriad of other sources, including contamination by either modern (so that they look artificially “young”) or “dead” carbon (materials, such as limestone, which are depleted in ^{14}C). Moreover, such replication—analyzing several dates from the same event (from either the same or different archaeological contexts)—makes for a more robust result. Secondly, a large sample of dates helps to resolve issues related to calibration. As outlined in Chapter 3, the portion of the radiocarbon calibration curve that corresponds with the Formative period contains three anomalous areas, which can be problematic for determining calendar ages with accuracy and precision. As radiocarbon dates represent a probability distribution and not an actual “date,” with a large number of samples it is possible to sum the individual probabilities, eliminating some of the ambiguity posed by one or two problematic

dates (i.e., a sample with a radiocarbon age of 2200 ± 50 , as discussed in Chapter 3). Only with a large number of assays does the complete picture emerge.

9.4 The Upper Formative in regional perspective

Elsewhere, Stanish and I (Stanish and Levine 2011) have discussed the role of competition and violence in the evolution of chiefly authority during the Upper Formative Period. Prior to this research, there was scattered evidence for conflict in the northern Titicaca area during the Formative. In addition to Plourde's settlement data from the Huancane-Putina region (Plourde 2006), Cohen (2010) found evidence for "*in situ* burning and dedicatory offerings of ceramic vessels and human bodies" at the early court site of Huatacoa; while Cohen herself interprets this finding as a ritual event, it can plausibly be interpreted as evidence for conflict. In her survey of fortifications of the northwestern Basin, Arkush (2005:275) discovered that the occupation of fortified hilltop settlements might have begun as early as the Middle or Upper Formative Period.

Based on the data presented in this dissertation, I argue that Pukara-affiliated peoples were responsible for the raid that resulted in the destruction of Taraco. The sudden decrease in the regional power of Taraco correlates chronologically with the rise of Pukara as a dominant political force in the northern Titicaca area in the first or second century AD. Radiocarbon dates from a deposit of "pure Pucara style rubbish" excavated by Kidder at the site of Pukara in the early 1950s virtually overlap in time with the data from Taraco. In other words, the Pukara settlement was at its height at when Taraco was burned. In the years following Taraco's decline, Pukara expanded significantly, and coercion would continue to figure prominently in its leadership strategies. This is reflected in a significant iconographic shift that accompanied the transition from the Middle to Upper Formative, discussed in Chapter 4. Iconography on carved

stone stelae, textiles, and pottery depicts people who appear to be valued for their military prowess, and speaks to increasing violence and changing avenues for political power. Images of trophy heads, conspicuously absent from the Yaya-Mama suite of icons, become widespread. By the Upper Formative, this motif appears in all types of media—lithic, ceramic, and textile arts—a popularity that suggests tremendous symbolic power (Stanish 2003:161). These types of images likely reflect the actual competition and political unrest that was taking place in the region at this time. Much like the dismembered and mutilated bodies depicted at San José Mogote and Monte Albán, such images would have been instantly recognizable symbols of authority that would have served as warnings to aspiring competitors.

While conflict may not have directly contributed to the rise of chiefly societies or emergence of regional centers, it appears to have been an integral component of the *evolution* of multi-community polities, and the development of increasingly complex forms of social, political, and economic organization. This idea is hardly novel; it is consistent with a number of recent studies (Drennan 1991; Flannery and Marcus 2003; Redmond and Spencer 2006; Spencer 2003; Webster 1998), and in fact, substantiates Carneiro's (1970) original thesis that warfare can have real implications for the development of state societies. The episode of organized violence identified at Taraco violence represents a whole new level of intra-group cooperation (one used in a non-cooperative way *against* another group), and is likely responsible for the development of complex, territorially expansive polities in the region.

Over the course of the Formative Period, Pukara may have developed new, alternative strategies that elaborated on those that first appeared during the Middle Formative as a means of competing with other centers, including Taraco. These two centers had coexisted for centuries, with neither able to emerge as a single dominant center. Competition with Taraco, which

steadily grew in size and complexity into the early part of the Upper Formative, may have been a major factor motivating the adoption or innovation of new behaviors that would ensure economic and political dominance. In evolutionary terms, changes in elite strategy reflect a new preference for types of cultural information aimed at internal security and overpowering an economic competitor. Over time, however, competition for resources and supporters would have become increasingly difficult as avenues for expansion became exhausted. A change in leadership and political strategies finally allowed Pukara to gain the upper hand over its rival. These strategies would have altered regional economic and political organization, refining the preexisting institutions of rituals, feasting, trade, and monument building. New methods of leadership, which likely included the strategic use of violence, would have enabled the polity to attract potential allies away from Taraco, and manage a population that was rapidly becoming denser. Within this new landscape of fear, Kidder's cache of curated heads takes on a whole new level of significance, perhaps represented the unglamorous consequences of contention or dissent.

The increasing tension in the north Basin can help to explain how violence became not only a viable political strategy, but also one that was preferable to other—perhaps more inclusive or peaceful—modes of attracting followers and eliminating competitors. However, an important question remains: where did this idea originate, and what sorts of prior examples, if any, existed by which participants could anticipate their relative chances of success? Furthermore, how is it possible to sustain the level of cooperation necessary to conduct raiding activity and large-scale conflict with regularity, and in the event of negative consequences? Of course, intra-basin innovation is the most obvious answer, but we must remember violence is an extremely risky strategy, and it is likely that a single failure would be sufficient to preclude any further attempts at coercive dominance. Also too, individual willingness to adopt violence as a political strategy

could be influenced not only by past examples of success, but also by perceived benefits. Cohen's work at Huatacoa provides a tentative suggestion regarding the origins of this newfound ideology. Her excavation of a ceramic cache in middle sunken court complex yielded an incised double-spout and bridge ceramic bottle (Figure 9.2), a form that is decidedly foreign to the *altiplano*. Such forms are, however, common among the cultures of the central and south coasts of Peru, specifically the Topará and Early Lima cultures. Based on these stylistic similarities, she argues that this vessel was an exotic import that provides direct evidence for trade between the central-south Peruvian coast and the northern Lake Titicaca Basin (Cohen 2010:185). However, analysis of the vessel paste suggested conformity with Chávez' typology (specifically, paste type FII:II-4/40), an indication of local manufacture. Subsequent analysis of this vessel with LA-ICP-MS confirmed this hypothesis, indicating membership in ICP Group 3, a clay source that is heavily associated with the site of Taraco and the surrounding site area.



Figure 9.2. Double-spout and bridge bottle discovered at Huatacoa (left: Cohen 2010:Figure 6.24)

Although these findings refute Cohen's initial interpretations, they are nevertheless extremely significant, and provide evidence for interaction and the exchange of ideas between

these culture areas. Similar results have been documented for the ideologically important Chavín style ceramics found on the Peruvian coast, which Druc and colleagues (Druc, et al. 2001) determined were actually locally manufactured facsimiles of those found at the site of Chavín de Huántar. Local production of an object that is superficially indistinguishable from the original might require the physical movement of people from one area to the other. Goods, as discussed in Chapter 2, can move over long distances through a series of local exchanges—a scenario that would not require interaction between the producers and the ultimate consumer.

It is likely the ideas moving between the coast and the *altiplano* were not restricted to material culture (i.e. how to make a double spout and bridge bottle), but also extended to other realms as well, and it is possible that the shifts in north Basin political climate in the first century AD were influenced by the activities of coastal peoples. Decapitated individuals and disembodied skulls are present in the coastal archaeological record from as early as 2000 BC at the site of Asia, and farther north, images of mutilated bodies and body parts adorn the facade of the Initial period temple of Cerro Sechín. Images of heads reach new levels of popularity at the end of the Early Horizon, figuring prominently in Paracas pottery and textiles (Browne, et al. 1993). The Paracas culture (ca 700 BC-AD 1) is roughly contemporaneous with the late Middle and early Upper Formative Period of the north Basin, and it is not unthinkable that the two areas—located approximately 700 kilometers apart—interacted on occasion. Importantly, Paracas peoples coexisted for a time with the Topará, a distinct cultural group from Cañete and Chíncha (Silverman and Isbell 2008), and whose pottery bears striking similarity to the double spout and bridge bottle from Huatacoa. While somewhat later in time—though still overlapping with the north Basin Formative to some degree—isotope analysis of a sample of Nasca trophy heads has shown that most of these individuals came from within the region, and therefore do not

represent the capture of enemy warriors through geographic expansion (Knudson, et al. 2009). Such results would be consistent with the type of intra-regional conflict suggested by the Taraco data. In light of the geochemical data, and given the long tradition of trophy head taking on the coast, I propose that interaction with south coast populations may have inspired the adoption of increasingly violent political strategies. That is not to say that diffusion is responsible for the development of increasingly complex polities in the Titicaca Basin; but rather, such interaction would have exposed *altiplano* residents to a new suite of cultural information, which, in addition to providing the new idea, would have also provided crucial evidence for the benefits of adoption. Of course, these ideas are tentative suggestions, and further research will hopefully shed light on this important instance of culture transmission.

With regard to the sustainability of such high levels of cooperation, a recent study by Mathew and Boyd (2011) provides important insight into the perpetuation of social norms that favor the subordination of individual self-interest to that of the group. They argue that the punishment of free riders plays a critical role in sustaining large-scale cooperation. For her dissertation, Mathew conducted extensive research among the Turkana, a nomadic pastoral society in East Africa, who regularly organize large-scale raiding parties composed of several hundred, often non-related, participants. These raids are extremely risky for participants, who regularly face the possibility of severe injury and even death, but produce highly desirable collective benefits. Mathews and Boyd view this type of warfare as a form of “high-stakes cooperation,” in which “individual warriors incur the costs of injury or death, but the gains from victory, such as defense, deterrence, or territorial expansion, benefit all” (Mathew and Boyd 2011:11375). Actions that minimize individual risk, such as shirking during combat, cowardice, or desertion, have the concurrent effect of lowering the group’s chance of victory. Due to such

potential consequences, non-participants are subject to serious sanctions, including collective corporal punishment or hefty fines, by third parties. Implementation of sanctions requires the collective action of the community, as no single individual has the authority to impose punishments. Mathew and Boyd suggest that, in the long run, such third-party punishment systems may have been sufficiently powerful to permit costly cooperation among large numbers of “unrelated and unfamiliar” individuals. Ultimately, these norms governing warfare, and their informal enforcement by third parties, create behaviors that benefit the entire Turkana ethnolinguistic group at the expense of smaller social units (Mathew and Boyd 2011). Such a behavioral trajectory over the long time span of the Formative may explain how large cooperative social units became the dominant form of political organization in regions where archaic states independently developed such as the Titicaca Basin.

Shifts in the use of monumental space may have also served to reify shifting social norms. In addition to the use of coercive force, other changes in elite political strategy are visible in the archaeological record of the central pampa at Pukara, excavated by Klarich in 2001 (Klarich 2005). The initial occupation of the central pampa yielded calibrated radiocarbon ages that correspond with the late Middle and Early Upper Formative occupations at Taraco. Extensive excavations and analysis revealed that this area was primarily dedicated to supra-household food-related activities during this early period. During this time the pampa was organized as an open, public place with unrestricted access, and as such, was an appropriate and likely venue for socially integrative activities (Klarich 2005:262). Together, these two lines of evidence suggest inclusive or corporate strategies among the early leaders, including activities such as entrepreneurial feasting. Subsequent occupations exhibit different leadership strategies, manifested by the reorganization of the central pampa into differentiated spaces—a craft

production zone, an area of ritual activities, and residential space (Klarich 2005:263). In this later phase, the central pampa was no longer an open space, but was instead divided into private and semi-private areas. This change in the function and use of space during the later phase of occupation reflects the central pampa's transition from a "monumental" to a more "mundane" space, which Klarich describes as,

‘filled in’ by artisans, locals performing small-scale ritual, and domestic activities. Considering the presence of such a diversity of activities across the pampa, this space may be interpreted as a ‘middle class’ residential zone; the large-scale wall could have served to delineate a *barrio*, as seen at Tiwanaku...or to divide residential and workshop areas. (Klarich 2005:264)

Rituals, essential components of the Formative political economy that had long taken place in the central pampa, were now restricted to the Qalasaya complex, indicating a preference for more exclusive power strategies by the resident elite. Interestingly, at Pukara, the archaeological correlates of these changing preferences are similar to those of other cities and states worldwide—a division of space resulting in the increased privatization of elite activities, with specialized workspaces. Klarich's use of the term *barrio*, a term generally reserved for such urban settlements of Teotihuacán, Monte Albán, and Chan Chan, underscore this likeness. Although Pukara is not an urban center, the developments identified by Klarich suggest a proto-urban character for the mid to late Upper Formative occupation.

In light of this information, it is possible to hypothesize a series of regional interactions that included both cooperation (alliances, trade, and food-sharing) and conflict (war and violence) between polities throughout their histories. Importantly, evidence of these interactions need not be purely hypothetical; the co-occurrence of Qaluyu and Pukara fineware in a single archaeological context speaks to the interaction and exchange of artistic canons between different cultural spheres. The burn event at Taraco is clear evidence for conflict and violence

between competing communities. Over the centuries, a few sites grew larger by absorbing or eliminating competitors until eventually only a handful of powerful centers remained. By the first century AD only two centers were regionally dominant in the northern Titicaca Basin—Taraco and Pukara. By no later than the early second century AD, Pukara had emerged as the largest regional polity, a period of florescence that lasted only until the later fourth or early fifth century.

A similar process of consolidation in the southern Basin led to the consolidation of several polities by the fifth century AD. In the southern Titicaca area, the process of state formation was a regional phenomenon beginning circa 700 BC and culminating with the development of Tiwanaku by circa AD 500. By the sixth century, the great state of Tiwanaku had emerged as the single dominant political power in the circum-Titicaca area. Less than two hundred years later, Tiwanaku had politically absorbed nearly all the resource-rich areas in the Titicaca Basin and beyond.

CHAPTER 10: CONCLUSIONS

10.1 Introduction

The major theoretical issue addressed in this dissertation is why groups of people choose to relinquish political autonomy in order to participate in increasingly complex forms of social organization. This problem is especially significant because, cross culturally, this transition often occurs after several millennia of living as mobile hunters/gatherers/fishers, and usually many centuries of living in relatively egalitarian settled villages. In these contexts, the shift towards a hierarchical settlement pattern is fairly rapid and marked by several changes in the political, economic, and social spheres. An evolutionary approach to culture change was used to examine the processes related to the emergence of regional centers. I have shown that the transition to more complex and cooperative forms of social organization directly results from changing preferences for certain variants of cultural information. It is my position that changes in individual and group preferences and decisions, over time, result in cultural evolution.

Examining how and why regional centers form requires analysis of the factors that influence the decision to accept or reject alternative (and cooperative) behavioral patterns. Cross-culturally,

many factors have been cited in the development of increasingly complex forms of social organization; these include, but of course are not limited to, violence, religion, or the natural environment.

The evidence from Taraco does not support a model in which a single prime mover is responsible for the rapid transformation of the political landscape in the Formative north Basin. The new data presented here underscore the importance of both cooperative and competitive behaviors for the emergence of complex polities, and demonstrate how the interaction among various non-state polities drives the growth and differentiation of a few central places across the landscape. Of these behaviors, war and trade have emerged as particularly important forms of interaction. Trade and war have similar effects on chiefly societies; both lead to the accumulation of external resources and to high-levels of intra-group cooperation. Cooperative behaviors—even when used in a decidedly non-cooperative manner against other groups—are essential for achieving economic and political success. In the long run, groups with high levels of within-group cooperation will be at a selective advantage over groups that are less well organized. Together, these two strategies likely underwrote the evolution of complex societies in the northern Titicaca area, and perhaps in other areas of the world where archaic states independently developed.

In light of these data, it seems unlikely that a single center could achieve regional political dominance in the absence of a competitor. Paradoxically, it is only through cooperation with these competitors, through trade, feasting, and other integrative activities, that this coveted political power can be attained. Such peer polity models may also help to explain the breakdown of polities, such as Pukara, following their ascent to regional dominance. As the sole political entity in a region, the need to develop new strategies to attract followers outperform competitors

no longer exists, and could potentially lead to an overall lack of innovation. This, together with a reliance on outdated political and economic strategies, could threaten long-term stability. Moreover, in the absence of a competitor, a major motivator of within-group cooperation—the foundation of a regional polity—has been eliminated. People no longer need to unite against an enemy. In order to safeguard against internal factionalization, polities would need to adapt to the changing political environment and find alternative means of promoting solidarity among their members. Such an idea, while hardly novel, is often overlooked when examining classic cases of socio-political collapse in both the archaeological and historical records. Perhaps if we were to evaluate some of these famous cases from an evolution of cooperation perspective, we may better understand why certain levels of success were, in the long run, not sustainable.

10.2 Competition and cooperation in the north Basin Formative

The data from Taraco dovetail with other recent work in the northern Titicaca area. Together, these data present a revised version of the cultural history and evolutionary dynamics of the northern Basin. The traditional linear conception of culture history, which theorizes a series of discrete cultures, each associated with their own distinct material style, is not supported by the data. Rather, the data suggest that the region was populated by numerous interacting polities that cooperated and competed with one another. Over time, some of these communities became larger than others, and there was a reduction in the total number of sites with non-domestic, corporate architecture, including sunken courts and monoliths. The region was host to a series of migrations (Janusek 2008; Stanish 2003), and there is substantial evidence for the persistence of local traditions, even while other, perhaps more iconic, traditions come and go. This revised culture history is presented below.

Work by Aldenderfer, Klink, and Craig allow us to say with much certainty that the first complex societies emerged out of the Archaic period to form settled villages by approximately 2000 BC. Starting around 1400 BC, people living in hundreds of these small villages began enhancing their villages with non-domestic structures, such as the courts found by Cohen at Huatacoa. There is no evidence for conflict at this time, and the majority of sites are situated in nondefensible locations. There was, however, a shared cultural pattern throughout the northern Basin that is known collectively and stylistically as Qaluyu.

Around 800 BC, some of these villages grow in size resulting in a two-tiered settlement hierarchy in the region. The settlement pattern includes larger villages with sunken courts, and smaller hamlets without. By 500 BC, the political landscape had changed. The beginning of the Upper Formative witnessed the earliest evidence for conflict in the archaeological record, including fortified and/or defensible settlements. Iconography on stone stelae, textiles, and pottery depict trophy heads and warrior-leader type personae.

Between 400-100 BC, a number of competing centers with multiple sunken court complexes emerged in the northern Basin. These sites were of roughly equal size and include Pukara, Balsas Pata, Cancha Cancha, Qaluyu, Huancanewachinka, Cachichupa, Saman, and Taraco, among others. While these centers competed for resources and allies, they were also highly cooperative, actively trading a host of high-status and exotic goods, and periodically gathering for feasts and ceremonies. It was around this time that competition in the region intensified. By AD 100, only two centers—Pukara and Taraco—were regionally dominant, and shortly thereafter Taraco was burned. The burn at Taraco was likely the culmination of centuries of inter-ethnic conflict in the region, and represents evidence for intensive raiding, most likely by the Pukara polity and/or its allies.

The data point to a substantial decrease in access to regional resources for the Taraco people following the burn event. As discussed in Chapter 9, the sudden decrease in the regional power of Taraco correlates chronologically with the ascendance of Pukara in the first or second century AD. Pukara's dominance of the northern Titicaca region would persist until no later than the fifth century AD. Work at Taraco has shed light on the post-Formative cultural dynamics in the north Basin area. There is no cultural hiatus following the collapse of the Pukara polity. Instead, the data suggest a substantial occupation by populations with no recognizable fine pottery style. At Taraco, residents leveled the terrace of Area A with nearly a meter of fill. They no longer built with fine stone or regularly engaged in long-distance trade.

Although this occupation lacked a fine pottery style, it was associated with a distinctive class of ceramic pastes that are referred to as "Huaña." First discovered by Cecilia Chávez, Huaña pastes represent a local tradition that actually has its origins centuries earlier. They are used to manufacture the forms, shapes, and sizes typical of the Formative period, and they are even associated with both Qaluyu and Pukara style decorative motifs. However, they are distinct from the Formative pastes, and follow a separate developmental trajectory, one that runs in tandem with the more traditional conception of ceramic chronology. Throughout the Formative occupation, "Early Huaña" (Huaña I) pastes coexist with the Formative ones. After the burn event, "Late Huaña" (Huaña II) pastes explode in popularity, outnumbering Formative pastes by several orders of magnitude. Importantly, survey work in the surrounding region has indicated a widespread distribution of early and late Huaña ceramics in the area by the end of the Upper Formative. Rather than a "hiatus," these data point to a reassertion of local polities and local traditions. In the post-Formative, these ceramics become the dominant style in the region, and likely filled the void that was left when the production of classic Pukara wares ceased.

10.3 Directions for future research

The research at Taraco, while illuminating numerous processes of cooperation and competition, has resulted in new models that warrant further testing with archaeological data. More attention is needed at the mounds surrounding Area A in order to identify and document the relationship among these settlements over the course of the Formative Period, and then into the subsequent, post-burn Huaña occupation. Work by Cecilia Chávez and Aimée Plourde (Chávez 2007, 2008b) at two nearby mounds (Areas I and H) has already produced some valuable data in this regard, however more systematic research at these sites and others in the immediate area is needed.

A primary concern of this future research should be the investigation of competitive leadership strategies during the first century AD. The data from Taraco present the first unequivocal, direct evidence for inter-polity violence during the Formative Period, but it is unlikely that the site was the sole victim of this increasingly competitive political landscape. We need to further examine the role that these strategies played among the communities of the north Basin Formative, and look at the ways that these played out alongside more inclusive modes of faction building. The data presented here suggests that groups that can successfully negotiate both types of leadership strategies—which both require high levels of within-group cooperation— will outcompete others in the long run.

It is also necessary to define and obtain dates for the architectural center of the Taraco site area. Following the pattern of other centers around the north Basin, this likely consists of a complex of multiple sunken courts. As Kidder first suggested, this area is likely under where the modern day church stands today, in the highest part of the main plaza of Taraco. This pattern would be consistent with other areas of Peru, where the Spanish built churches atop local *huacas*,

an effort that was designed to discourage local forms of religious expression, while promoting Catholic ideals. Moreover, the stairs of the modern church contain sandstone slabs that are virtually identical to those lining the monumental sunken court complex at Pukara—a strong indication that there was once a sunken court in the immediate vicinity at some point in the history of the area.

Excavation in this area expands on many of the ideas presented in Chapters 2 and 4. This research would permit analysis of the development of non-domestic, “corporate” forms of architecture, and monitor processes of “ritualization” (Cohen 2010) at Taraco. As discussed in Chapter 4, the relationship between non-domestic architecture and increasing social complexity is well established in the northern Titicaca area, and figures prominently in the wider anthropological and archaeological literature. I have argued that these constructions foster social cohesion and promote cooperative ideologies. Corporate architecture plays a critical role in the reification of social norms; this can be seen in both the early forms of sunken court architecture, which encouraged cooperation among non-related households, as well in the later shifts in monumental architectural patterns, which served to maximize status inequalities. The investigation of corporate architecture at Taraco would be an ideal way to test these propositions, and would serve as an invaluable complement to the residential data presented in this dissertation.

In addition, it is also necessary to continue monitoring patterns of local and long-distance exchange. While additional compositional analysis of obsidian may not be useful for demonstrating participation in long-distance trade networks, as all obsidian must be imported from a distance, it may be helpful for discerning status differentials among the residents of Area A. Existing data suggest that trade relationships were not maintained at the community level, but

this a tentative hypothesis that must be tested with additional data. We must also define Formative centers of projectile point production and distribution, and track the movement of these artifacts across the region. This may be accomplished through the analysis of points and debitage, as this ratio provides an important index of access to sources of this valuable import. Given the decreased emphasis on hunting during the Formative, it is likely that these points served as wealth objects that were perhaps fetishized and almost certainly exchanged with some measure of meaning and symbolism. They likely served a similar function as the high-status ceramics, the exchange of which materialized affiliations and alliances.

The analysis of these ceramic finewares using LA-ICP-MS likewise presents numerous exciting avenues for future research. I believe that the study of 257 specimens presented here has only demonstrated a fraction of what this technique can offer. Already a number of patterns have come to light, but unfortunately, for some of these patterns, there is not enough data to draw conclusions with absolute certainty, and thus these interpretations remain somewhat anecdotal. Systematic comparison between materials from sites in the Huancané-Putina region and the Taraco area must be pursued in order to test the suggestion that the exchange of certain classes of artifacts was not reciprocal. Expanding the sample to include more specimens from both regions, as well as other, perhaps defensible locales, will allow for a more comprehensive understanding of the nature of local exchange—patterns that are inexorably linked to inclusive leadership strategies.

10.4 Conclusions

The development of aggregated regional centers during the latter part of the Middle Formative was one of the most important transitions in the history of human occupation in the northern

Titicaca Basin. Excavations at Area A of Taraco revealed a stratified occupational sequence reaching nearly four meters in depth, and consisting of eight occupational phases. Occupation at Taraco began prior to 1150 BC and continues through the present day. This work indicated a long Qaluyu occupation characterized by the use of fine ceramics, access to exotic materials, and periodic episodes of site burning. This Middle Formative occupation was followed by a major early Pukara period settlement that included numerous examples of fine stone architecture. The data from this high status residential sector presented a unique opportunity to monitor the development of a regional center, as well as the subsequent region-wide transformations in the nature of chiefly authority.

The Phase 1 occupation at Taraco was most likely characterized by a small settlement that was loosely integrated into some kind of regional political system. This phase would be comparable to the early Qaluyu periods characterized by a series of small, competing polities around the northern Basin (see Stanish 2003:Chapter 6). Phase 2 dates to the late Qaluyu period in which competition was brisk and there was an intense period of political and economic expansion in the region as a whole.

Phase 3, the latest of the Formative occupations, corresponds with early Pukara and represents the highest level of socio-political complexity in the Taraco region. This occupation was destroyed in a major burn event dated to the first century AD. This event was an episode of deliberate destruction that represents evidence for intensive raiding, most likely by the Pukara polity and/or its allies.

Together with the analysis of excavated materials, these results indicate that both cooperative and competitive strategies defined the social relations of the early part of the Upper Formative in the northern Titicaca Basin. These data suggest that the negotiation of both

competitive (violent or exclusive) and cooperative (inclusive) was an important factor that contributed to increasing social complexity in the region. These findings are relevant to theoretical discussions of the complex relationship between competition and cooperation—and their associated behaviors—and present numerous directions for future research.

Finally, the research presented here allows us to begin refining our concept of Upper Formative temporal dynamics in the northern Basin. I propose that this period (500 BC-400 AD) may be divided into two phases that correspond with observable political shifts in the region. The early part of the Upper Formative must be understood as a period characterized by the complex negotiations of two political and economic powers. It may be separated from the latter part of the Upper Formative by a single episode of violence, ca. AD 100, after which only one center remained. By the second half of the Upper Formative, construction of fine architecture at Taraco had ceased, along with production of distinctive Qaluyu fineware and Yaya-Mama style lithic art. Through further research in the Taraco site area and elsewhere in the north Basin, we may continue to investigate this proposed temporal division, and obtain additional data in order to date relevant changes and events with even greater precision.

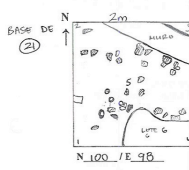
APPENDIX A Sample Field Forms

1. Capa/Nivel (Stratum/Level) form

Proyecto Taraco Perú 2006 Sitio: Taraco

FORMULARIO DE CAPA/NIVEL

Area: A Unidad: II-4 Rasgo: - Lote: 6 Capa/Nivel: VIII/01
 Responsable: ABL Fecha: 17 JUL 06 Nº de Baldes: 32
 Lote 6: 8 ^{1º solo nivel}



1) 193 / -) /
 2) 192 / 198.5) /
 3) 193 / 201) /
 4) 190 / 192) /
 5) 190 / 192) /
 6) 192.5 / 194.5) /

Cota: POSTE
 Grosor Medio: 3.80cm
 Solo Lote 6: 2cm

DESCRIPCIÓN DE LA CAPA

Composición Natural: (Tipo de terreno, color, compactación, tamaño y forma de los agregados, contenido orgánico, etc.)
COLORES: SUR 4/3 LA MISMA TIERRA COMO NIVEL 00 UNA MEZCLA DE CENIZA, ARCILLA PREPARADA (QUEHADA), Y TIERRA TIERRA COMPACTA. PERO EL PARTE DE CENIZA ES SUETA. TODAVIA TIENE PIEDRAS DE 7-10CM. INCLUSIONES DE MADERA Y CARBÓN. LOTE 6 SIGUE CON CENIZA Y CARBÓN

Composición Cultural: (Tipo de material, distribución, cantidad aproximada)
CERAMICAS DISPERSAS (FORMATIVAS), HUESO QUEMADO.

Asociaciones: (Naturaleza del contacto con la capa anterior, elementos de distinción, implicancia temporal y elementos de juicio, implicancia estratigráfica, etc.)
LA PARTE DE CADA VIII COMO NIVEL 00 CIA TIERRA/ INCLUSIONES CON LO MISMO ESTA ABAJO DE LA CAPA DE CENIZA, Y ES PARTE DEL INCENDIO. LA IS0AD (FORMATIVO MEDIO + TEBRID) DISTINTO POR SU COLORE (ROJO) Y COMPACTACION.

DESCRIPCIÓN DEL NIVEL

(Correspondencia del nivel y la capa, asociación con otros niveles, elementos característicos, justificación de su excavación, etc.)

01 ES EL SEGUNDO NIVEL DE CAPA VIII, Y EMPEZAMOS EXCAVANDO 10CM EN DOS PASOS DE 5CM. PERO ENCONTRAMOS UNOS CANGRIJOS DE CERAMICAS EN UN POSICION DIANO, SIGNIFICANDO EL PRIN DE LA CAPA. 01 CORRESPONDE CON 01 EN III, Y 02 EN II-3 Y II-4. TAMBIEN CORRESPONDE CON EL INCENDIO DE UNIDAD I

REGISTRO DE MATERIAL			REGISTRO GRAFICO				
Nº Balde	Material	Prof.	Digital	Digital	Rolló	Toma	Plantas:
1992	FLUJ		20-21	24	BASE 01	ABL	45
1997	CERAMICA (48)						
1998	LITULO (7)						
1999	HUESO (2)						
1993	HUESO DE NIVEL 193						Cortes:
1995	CERAMICA DEBIDA EN BASE 01 (4)						
1990	FLUJ LOTE 6						
1991	CERAMICA LOTE 6 (2)						
1992	HUESO LOTE 6 (48)						

NOTAS

- PROCEDENCIA 1993 - AT 198cm del N. IV. con F190cm
- EL BASE DE CADA VIII ES MAS ADECUADA EN III QUE II-3
- ES POSIBLE QUE LOTE 6 SEA UN LUGAR PARA PREPARACION DE CERAMICA TIENE MUCHO CENIZA Y ARCILLA QUEHADA
- ENCONTRAMOS CERAMICAS PLANOS AL BASE DE ESTE NIVEL
- ENCONTRAMOS MAS DE HUESO I EN ESTE NIVEL
- EL ULTIMO NIVEL QUE EXCAVAMOS EN II-4

2. Rasgo (Feature) form

Proyecto Taraco Perú 2004 Sitio: Taraco

FORMULARIO DE RASGO

Rasgo: 10

Area: A Unidad: II-3 Lote: - Capa/Nivel: 22
 Responsable: ABL Fecha: 18 JUL 06 Nº de Baldes: -

FUNCION SUGERIDA: TECHO QUEMADO
 PROFUNDIDAD: Arriba: 200cm (+) Abajo: 210-218cm del G06500: 5-9cm

DESCRIPCIÓN: (Forma, orientación, dimensiones, contenido natural y cultural etc.)
TECHO QUEMADO ASOCIADO CON HUESO I; HUECO DE TOTORA Y PAJA. TAMBIEN CONTIENE PALOS Y POSTES QUEMADOS. EN LA SUPERFICIE HABIA FORMAS DE ADONES (UNO EN EL CENTRO Y OTRO EN LA ESQUINA NORESTE). PARA EXCAVAR, SEGUIAMOS LA TIERRA NEGRA (COCAS QUEHADAS); EL MATERIAL CONTIENE PALO, TIERRA, CENIZA, ADOBE CAL Y ARCILLA PREPARADA EN EL LADO SUROESTE DEL RASGO HAY UN CILINDRO DE TIERRA BLANCA (CAL) ENCONTRAMOS UNA PIEDRA DE CANTO (POSIBLE DE CANELO), PROBABLE PARA AMARRAR LOS PALOS. TOTORA Y PAJA SON VISIBLES ESTAS TIENEN UNA CAPA DE ARCILLA ROJA (CASQUILLO-DISO), Y UN FORMATIVO DE UN MONOLITO OALUVA ASOCIACIONES: CON SERPIENTE, TIENE SU PALO TAMBIEN.

RASGO 10 ES EL TECHO DE MURDO I. SU PISO (RASGO 11) Y SU BASAL (RASGO 12) CONTIENE CERAMICA DISTORBIDA QUEMADA Y OALUVA; Y RASGO 12 CONTIENE CERAMICA DISTORBIDA QUEMADA. ENTONCES RASGO 10 ES PROBABLE DEL PERIODO TEMPRANO (O PERIODO MEDIO TEMPRANO).

REGISTRO DE MATERIAL			REGISTRO GRAFICO				
Nº Balde	Material	Prof.	Digital	Digital	Rolló	Toma	Plantas:
1994	M CARBON	205	219-230	BASE 10		ABL	46
1995	" "	204					
1996	CERAMICA						
1997	HUESO						
1998	ARCILLA COCIDA						
1999	ARCILLA COCIDA + PAJA						Cortes:
1990	ELUTACION						
1998	PALO QUEMADO	208					

NOTAS

- CONSULTAR CON LOS DIBUJOS PARA ALTURAS Y DIMENSIONES
- LA PROFUNDIDAD DEL TECHO ES 5-9cm

3. Muestra de Tierra (Soil Sample) form

Proyecto Taraco Perú 2004 Sitio: Taraco

FORMULARIO DE MUESTRAS DE TIERRA

Bolsa: 1922

Area : A Unidad: II-3 Capa/Nivel: 23 Rasgo: - Lote: -

Responsable: PUDAD Fecha: 19 JUL 06

CONDICION DE LA MUESTRA: Húmeda: - Seca: X Peso aprox.: 5L

DESCRIPCION DE LA MUESTRA: (Tipo de tierra, inclusiones, color, contenido natural y cultural, etc.)
DE LA TIERRA EN NIV 23 AFUERA DEL PASEO
(CONSULTA DIBUJOS PARA BASE NIV 22 Y BASE 25 PARA
DIRECCIONES)

PLANTACION - CARBONES, ESCAMA DE PESCADO, NÁS MEDIDAS
FINAS Y MEDIANAS

RELACION A OTRAS MUESTRAS:
#1921 - MUESTRA PARA GUARDAR, MISMA CAPA/NIVEL.

PROCEDENCIA: Describa el contexto de procedencia (Rasgo, Capa/Nivel, Lote) así como la asociación con otros contextos
NIV 23 (AFUERA DEL PASEO II) DE UNIDAD II-3

4. ¹⁴C Sample form

Proyecto Taraco Perú 2004 Sitio: Taraco

FORMULARIO DE MUESTRAS DE C-14

Bolsa: 1894

Area : A Unidad: II-3 Capa/Nivel: 22 Rasgo: 10 Lote: -

Responsable: ADL Fecha: 17 JUL 06

MUESTRA DE: PAJA QUEMADA Tamaño aprox. - Peso: -

Prof. desde el Datum: 205cm Prof. desde la superficie: -

CONDICION DE LA MUESTRA: Húmeda: - Seca: X

Mezclada (sí/no): SI Con: POCO DE TIERRA

Simple: X Compuesta: - Explique: -

CALIDAD DE LA MUESTRA:
 Excelente: X Muy Buena: - Buena: - Regular: - Mala: -

EVIDENCIAS DE CONTAMINACION: POCO

PRIORIDAD DEL FECHADO: Alto: X Moderado: - Bajo: -

¿Hay otras muestras que puedan dar la misma información? (sí/no) SI

Anote sus números de bolsa 1895 / - / - / -

PERIODO CULTURAL ATRIBUIDO: POPULATIVO TARDIO (TEMPERANO)

FUNCION SUGERIDA DEL AREA DE EXCAVACION: (vivienda, conchero, templo, etc. Incluye además el uso actual del terreno)
TECHO QUEMADO (PARTE DE UNA CASITA)

(USO ACTUAL - AGRICULTURA)

PROCEDENCIA: Describa el contexto de procedencia (Rasgo, Capa/Nivel, Lote) así como la asociación con otros contextos
PASEO 10 NIV 22 UN II-3
ALT: 205cm N: 155cm E: 14cm

APPENDIX B Correspondence of arbitrary levels and natural stratigraphy (Units I and II)

Stratum	Excavated Level (Unit II)	Excavated Level (Unit I)	Function	Composition
UII-I	1; 2		Modern surface	Cultivated soil; 7.5YR 5/2--5/3
UII-I	3; 4; 5	-	Modern fill	Silty loam with sand, semicompact; modern materials. 10YR 4/3
UII-III	Lot 1; 4 (UII-III)	-	Fill	Soil mixed with ash; 10YR 5/2
UII-IV	6; 7	-	Fill; Collao and Inka	Semicompact loam; Collao and Inka ceramics. 7.5YR 4/2
UII-V	8	-	Huaña Activity Surface 1	Compact sandy loam. 20-30% inclusions such as ceramic, bone, and gravel. 7.5YR 4/3
UII-VI	9	-	Huaña Activity Surface 2	Compact sandy loam. 20-30% inclusions such as ceramic, bone, and gravel. Huaña. 10YR 4/3
UII-VII	10; 11	-	Fill	Sandy and silty soil with some clay. 10YR4/3
UII-VIII	12; Lot 4	-	Stony fill	Soil matrix with high density of stones and gravel. 7.5YR 4/3
Lot 2/3	Lot 2; Lot 3	-	Gravel fill	Brown matrix with 50% inclusions such as gravel and bone.
UII-IX	13; 14 [UII-2:14]	-	Fill	Semicompact silty loam with sand; red clay and carbon inclusions. 7.5YR 4/3
UII-X	15; 16 [UII-2: 15]	-	Fill	Semicompact sandy loam. 10YR 5/3.
UII-XI	17 [UII-2: 16]	12; 13; 14	Burn event; Upper Formative	Soil mixed with ash; matrix contains Pukara decorated ceramics. 10YR 4/4.
UII-XII	18; 19 [UII-2: 17]	15; 16	Burn event; Upper Formative	Soil mixed with ash; clay and carbon inclusions. 10YR 3/3.
UII-XIII	20; 21; 22 [UII-2: 18, Lot 8]	17; 18; 19	Burn event; Upper Formative	A mix of soil, ash, carbon, and burned clay. 5YR 4/3.
Lot 6	Lot 6	-	Midden; Upper Formative	Soft soil with ash; many burned bones. 10YR 3/2.
UII-XIV	23 [UII-2: 18, Lot 9]	-	Burn event; Upper Formative	Very similar to UII-XIII; distinctive color. 5YR 3/3.
UII-Feature 10	Lot 5; Feature 10 (Level 22)	-	Burned roof; Upper Formative	Mix of <i>paja</i> , <i>titora</i> , burned wood, black soil, ash, adobe, chalk, and prepared clay.

Stratum	Excavated Level (Unit II)	Excavated Level (Unit I)	Function	Composition
UII-Feature 11	Feature 11 (Levels 23, 24, 25)	20; 21	Floor; Upper Formative	Fine, compact clayey soil. 5YR 5/4-5/3
Lot 7	Lot 7	-	Ash lens	Semicompact fine soil mixed with ash. 2.5Y 4/4.
UII-XV	26; 27; 28; 29; 30; 31; 32; 33A	-	Occupational surface; Early Upper Formative	Fine clayey soil with whitish inclusions and angular stones. 7.5YR 3/3.
UII-XVA	26; 27; 28; 29	22; 23; 24; 25; 26; 27; 28; 29	Occupational surface; Early Upper Formative	See UII-XV
UII-XVB	30; 31; 32; 33A	30; 31; 32	Occupational surface; Early Upper Formative/ Middle Formative	See UII-XV
UII-XVI	33B; 34B	33	Occupational surface; Middle Formative	Compact clayey soil with gravel. 7.5YR 4/4.
UII-XVII	34A	-	Occupational surface; Middle Formative	Clayey soil with a moderate density of ash; whitish inclusions, red clay, and yellowish soil. 5YR 3/2.
UII-XVIII	35; 36	34; 35	Occupational surface; Middle Formative	Semicompact clayey soil with angular gravel measuring 2-4 cm. 7.5YR 4/4-5YR 3/4.
UII-XIX	37; 38	36	Occupational surface; Middle Formative	Clayey soil with carbon and gravel inclusions. 5YR 3/3

APPENDIX C Radiocarbon Dates from Area A

Table C.1. ^{14}C Samples from 2006 and 2007 Excavation Seasons (collected by A. Levine)

Lab ID	Project ID	Unit	Context	Material	^{14}C Age (BP)	Calibrated Age* (cal BC/AD)
UCIAMS -37489	TA-1628	UII-2	Fea. UII-4	charcoal	205±20	1650-1950 cal AD
UCIAMS -86316	TA-1894	UII-3	Fea. UII-10	<i>ichu</i> grass	1960±20	0-95 cal AD
UCIAMS -86324	TA-1895	UII-3	Fea. UII-10	<i>ichu</i> grass	1995±20	40 cal BC-55 cal AD
UCIAMS -86317	TA-1908	UII-3	Fea. UII-10	wood charcoal	2490±20	765-540 cal BC
UCIAMS -86322	TA-1983	UII-3	Fea. UII-14	charcoal	1955±20	0-85 cal AD
UCIAMS -86323	TA-2066	UII-3	UII-XIX	charcoal	2945±25	1260-1055 cal BC
UCIAMS -86319	TA-5104	PI-8	Fea. PI-6	<i>ichu</i> grass	2020±20	55 cal BC-30 cal AD
UCIAMS -86320	TA-5105	PI-8	Fea. PI-6	<i>ichu</i> grass	2050±20	115 cal BC-5 cal AD
UCIAMS -86318	TA-5103	PI-8	Fea. PI-6	wood charcoal	2115±20	200-90 cal BC
UCIAMS -86321	TA-5106	PI-8	Fea. PI-6	wood charcoal	2135±20	205-90 cal BC
UCIAMS -86325	TA-5199	PII-13	Fea. PII-11	charcoal	1625±20	385-456 cal AD (0.72); 480-535 cal AD (0.28)
UCIAMS -86326	TA-5200	PII-13	Fea. PII-11	charcoal	1640±20	345-440 cal AD

*Calibration using CALIB 6.0 and IntCal09 data set. Single interval 2- σ range calibration values listed for intercepts >0.95 relative area under probability distribution where multiple intercept interval separations are <20 yrs. Multiple intercepts are listed for each intercept with relative areas under probability distribution >0.10 noted in parentheses where calibration interval separation are >20 yrs.

Table C.2. ¹⁴C Samples from 2004 Excavation Season (collected by C. Stanish)

Lab ID	Project ID	Unit	Context	Material	¹⁴ C Age (BP)	Calibrated Age* (cal BC/AD)
AA66240	TA-1107	UI-1	Level 8	bone	1781±37	130-350 cal AD
AA66238	TA-1153	UI-2	Level 11	bone	1805±37	125-265 cal AD (0.85); 275-335 cal AD (0.15)
AA63326	TA-1176	UI-2	Level 13	charcoal	1746±40	210-405 cal AD
AA66239	TA-1190	UI-2	Level 14	soil carbon	1811±38	120-260 cal AD (0.87); 280-330 cal AD (0.11)
AA63328	TA-1225	UI-2	Level 17, Fea. 6	charcoal	1885±40	50-240 cal AD
AA63327	TA-1294	UI-2	Level 22	charcoal	1826±39	80-260 cal AD
AA63324	TA-1430	UI-1.2	Level 34	charcoal	2918±40	1260-1000 cal BC

*Calibration using CALIB 6.0 and IntCal09 data set. Single interval 2-σ range calibration values listed for intercepts >0.95 relative area under probability distribution where multiple intercept interval separations are <20 yrs. Multiple intercepts are listed for each intercept with relative areas under probability distribution >0.10 noted in parentheses where calibration interval separation are >20 yrs.

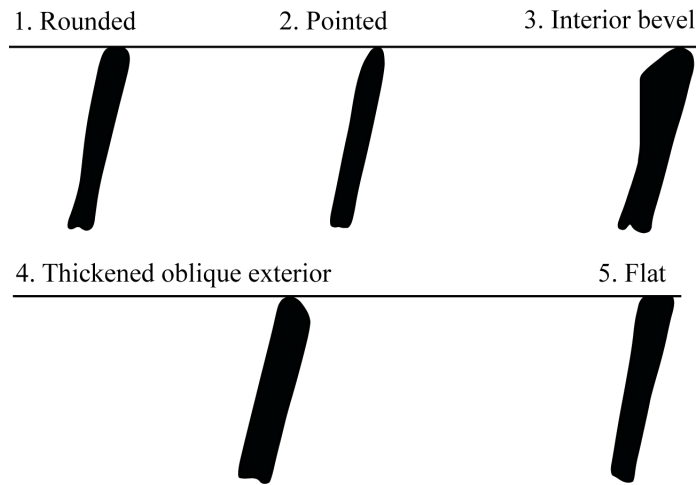
APPENDIX D Index of Ceramic Vessel Forms

(adapted from Chávez 2008a)

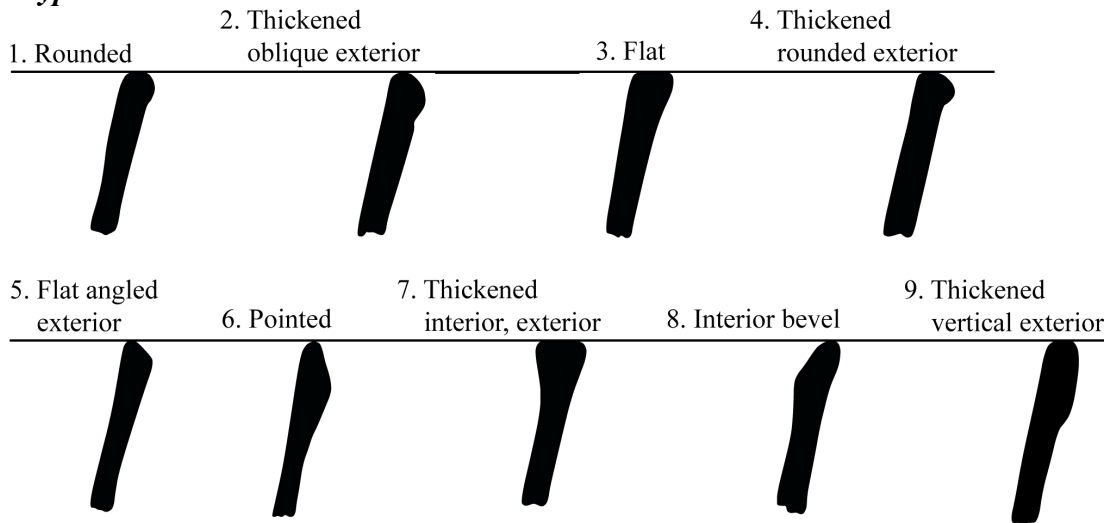
1. Open Vessels

1.1. *Tazones* (direct-walled bowls)

1.1.1 *Type A*

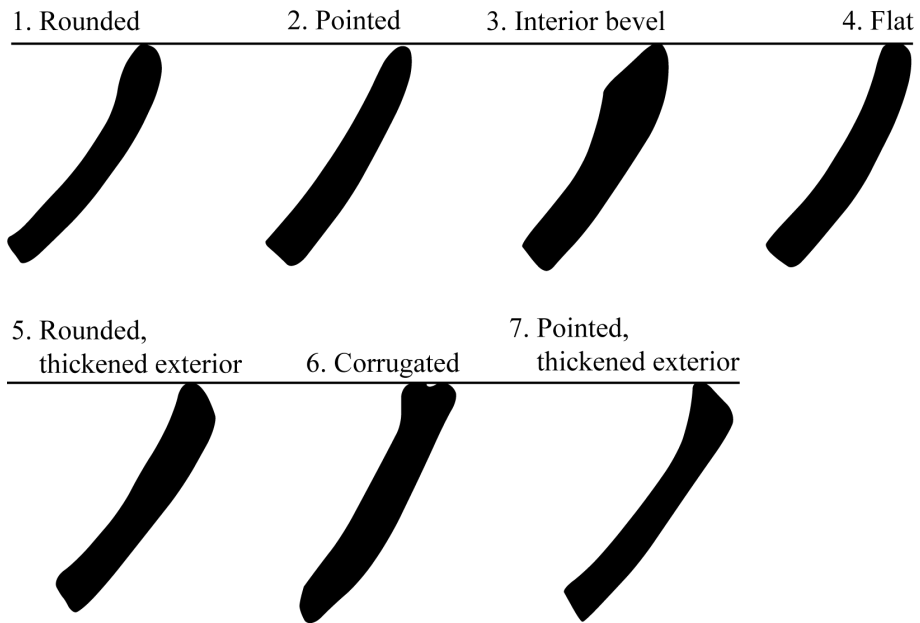


1.1.2 *Type B*

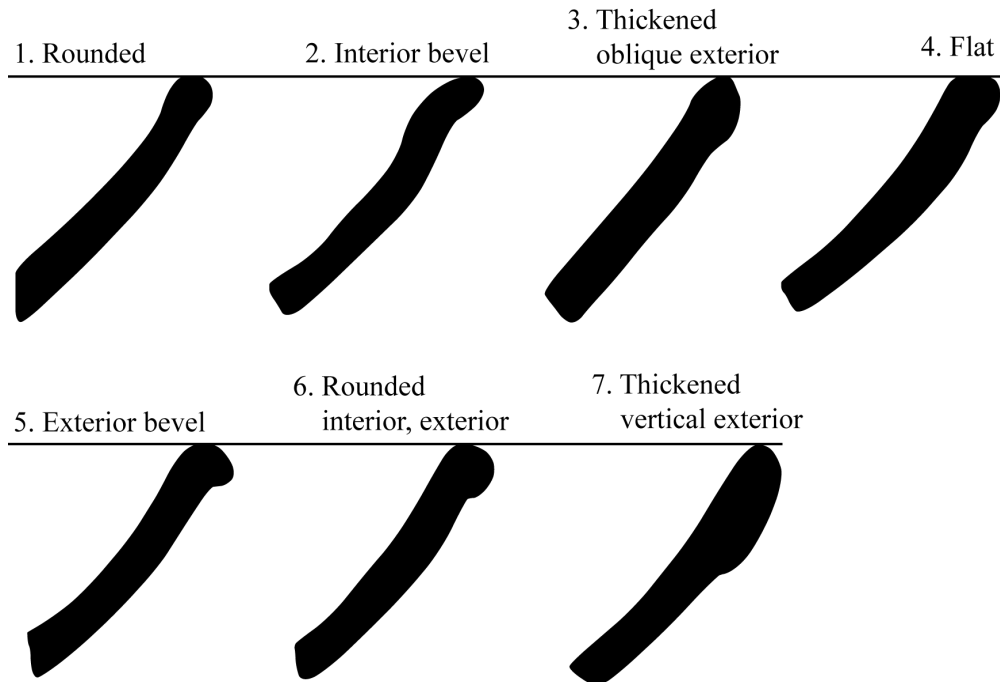


1.2 Cuencos (convex-walled bowls)

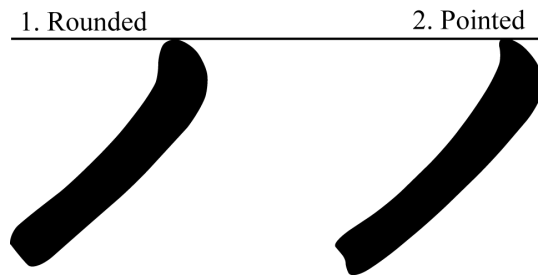
1.2.1 Type A



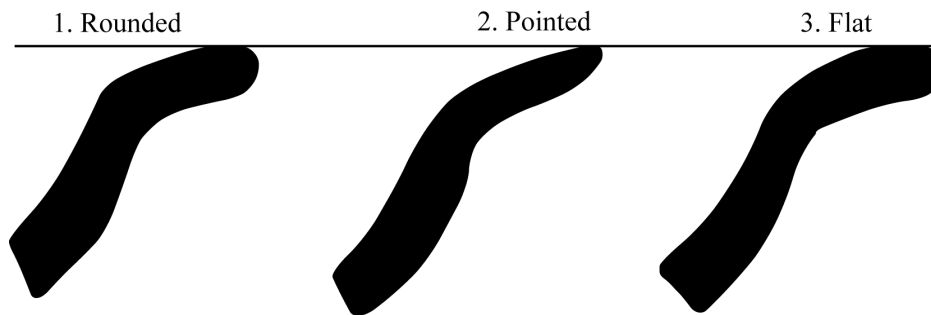
1.2.2 Type B



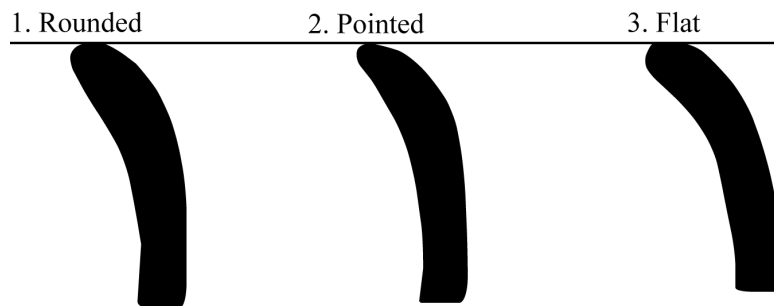
1.2.3 Type C



1.2.4 Type D

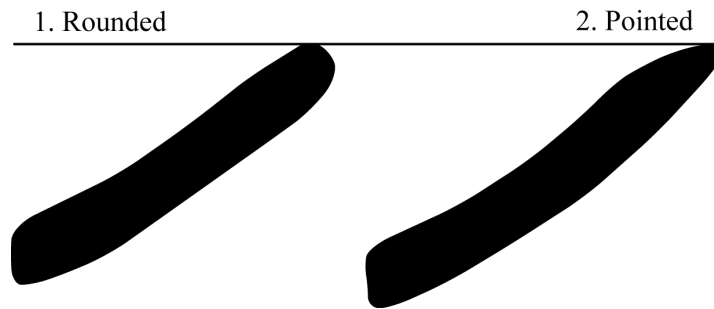


1.2.5 Type E

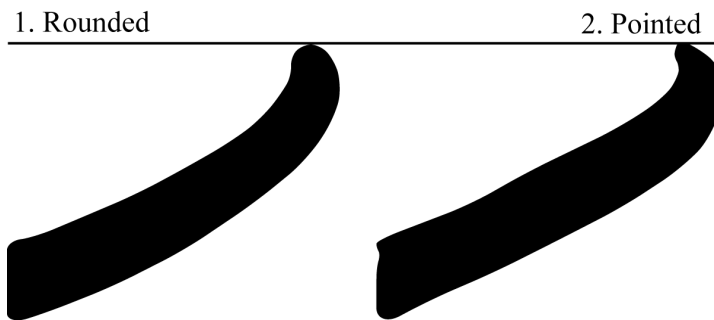


1.3 *Platos* (plates)

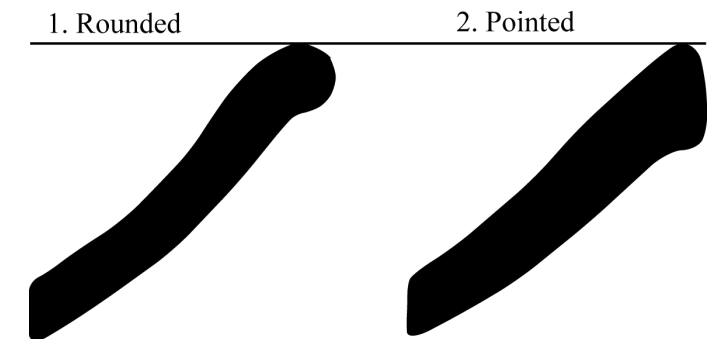
1.3.1 *Type A*



1.3.2 *Type C*



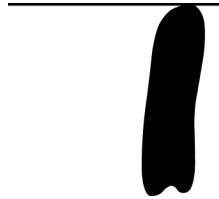
1.3.3 *Type D*



2. Closed Vessels

2.1 *Jarras* (jars)

2.1.1 *Type A*

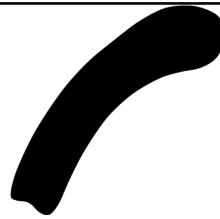


2.1.2 *Type B*

1. Interior angle
between 10-15°



2. Interior angle
between 20-30°



2.1.3 *Type C*

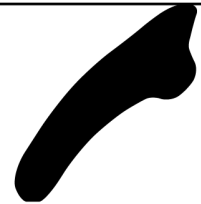
1. Rounded



2. Thickened exterior

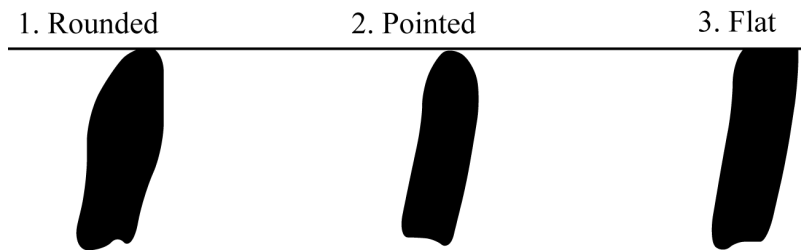


3. Pointed

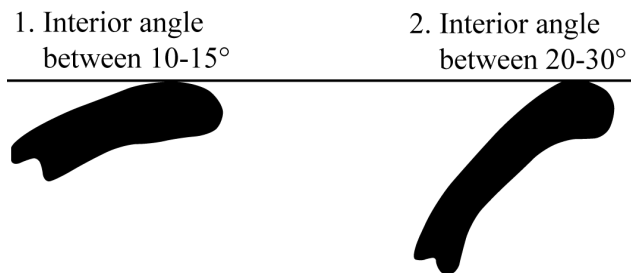


2.2 *Cantaros* (large jars)

2.2.1 *Type A*

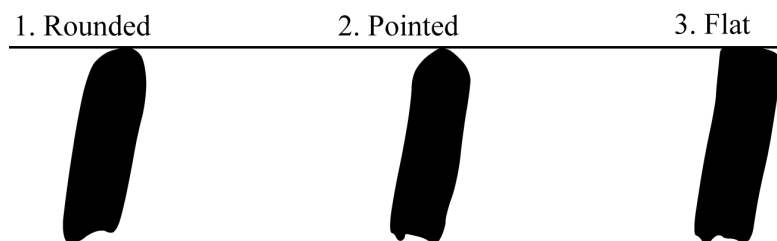


2.2.2 *Type B*

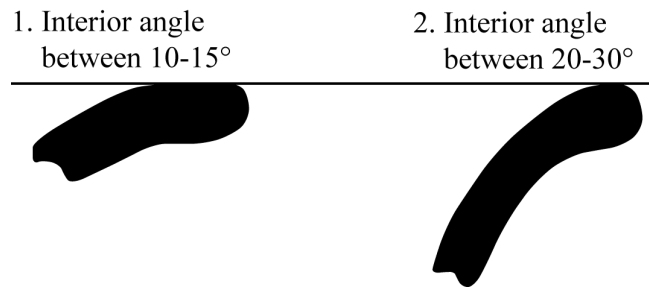


2.3 *Ollas* (cooking pots)

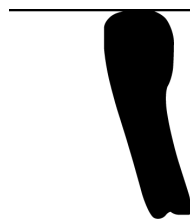
2.3.1 *Type A*



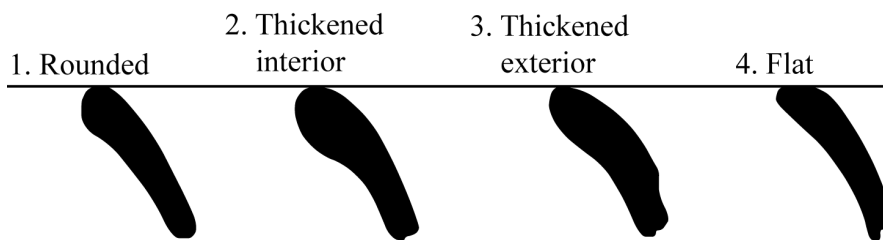
2.3.2 Type B



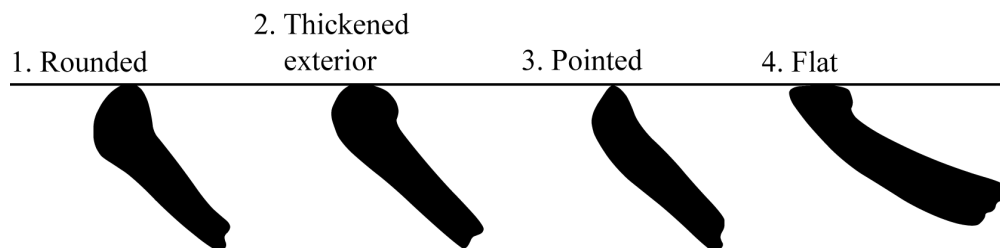
2.3.3 Type C



2.3.4 Type D

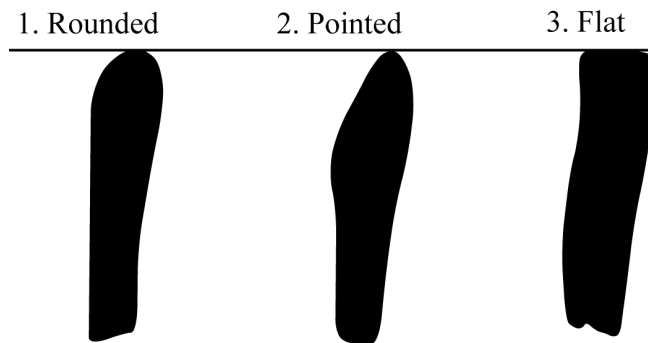


2.3.5 Type E



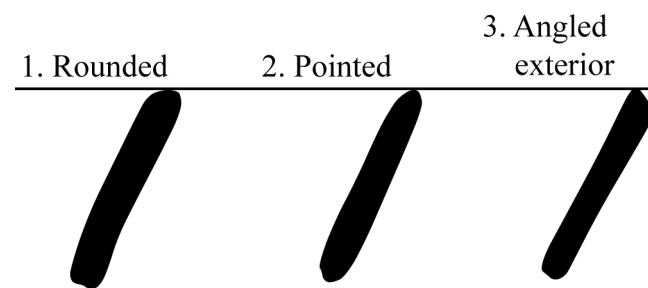
2.4 *Botellas* (bottles)

2.4.1 *Type A*



2.5 *Vasos*

2.5.1 *Type A*



APPENDIX E Analysis of Formative Ceramic Forms: Results

Function	Vessel Type	Variant	Phase 1		Phase 2		Phase 3		
			Count	Avg. Diam (cm)	Count	Avg. Diam (cm)	Count	Avg. Diam (cm)	
Serving	Cuencos	A1	-	-	3	12	31	16.48	33%
		A2	-	-	-	-	2	-	2%
		A3	-	-	2	21	3	16	3%
		A4	-	-	4	15	6	16.4	6%
		A5	-	-	4	17.75	23	17.68	25%
		A6	-	-	-	-	1	17	1%
		A7	-	-	-	-	1	20	1%
		B1	-	-	2	22	11	16.6	12%
		B2	-	-	-	-	1	28	1%
		B3	-	-	2	17.5	1	15	1%
		B4	-	-	-	-	5	19	5%
		B5	-	-	2	21	-	-	-
		B6	-	-	2	18	-	-	-
		B7	-	-	-	-	1	27	1%
		B8	-	-	-	-	-	-	-
C1	-	-	-	-	1	25	1%		
D1	-	-	-	-	1	18	4%		
D3	-	-	2	10	-	-	8%		
E1	-	-	-	-	4	13.75	4%		
E3	-	-	-	-	1	24	1%		
Totals	-	-	-	-	24	17.26	93	17.27	16%
Tazones	A1	-	-	2	14.5	11	17.44	19%	
	A3	-	-	2	24	-	-	-	
	A4	-	-	2	19	6	15.2	11%	
	A5	-	-	5	20.5	5	16.5	9%	
		-	-	-	-	-	-	-	

Function	Vessel Type	Variant	Phase 1			Phase 2			Phase 3		
			Count	Avg. Diam (cm)	%total*	Count	Avg. Diam (cm)	%total	Count	Avg. Diam (cm)	%total
Serving	Tazones	B1	-	-	-	4	20.25	11%	7	17.5	12%
		B2	-	-	-	1	24	3%	3	17.33	5%
		B3	-	-	-	1	17	3%	1	18	2%
		B4	3	29.33	50%	5	22.2	14%	4	15	7%
		B5	1	25	17%	10	22.9	27%	5	18.75	9%
		B6	-	-	-	-	-	-	1	29	2%
		B7	-	-	-	1	20	3%	1	19	2%
		B8	1	-	17%	2	27.5	5%	1	16	2%
		B9	1	29	17%	1	16	3%	12	20.46	21%
		Totals	6	28.4	20%	36	21.43	31%	57	18.08	10%
Cooking	Platos	A1	-	-	-	-	-	-	1	19	50%
		D1	-	-	-	-	-	-	1	19	50%
		Totals	-	-	-	-	-	-	2	19	0.3%
		A1	2	19	9%	1	19	3%	55	16.98	23%
Cooking	Ollas	A2	1	18	4%	1	-	3%	12	18.63	5%
		A3	1	28	4%	3	22.5	8%	29	17.5	12%
		B1	-	-	-	-	-	-	1	15	0%
		B2	3	29.67	13%	9	17.11	24%	96	17.29	40%
		C1	-	-	-	-	-	-	1	-	0%
		D1	5	22.3	22%	7	18.2	19%	18	17.4	7%
		D2	6	20.33	26%	2	7	5%	3	27	1%
		D3	1	16	4%	1	17	3%	-	-	-
		D4	-	-	-	2	15	5%	3	16.5	1%
		E1	-	-	-	3	18.5	8%	12	16	5%
		E2	1	18	4%	6	26.83	16%	6	24	2%
		E3	3	18	13%	1	18	3%	3	18.67	1%
		E4	-	-	-	1	20	3%	2	24.5	1%
		Totals	23	22.06	77%	37	19.32	31%	241	17.53	41%

Function	Vessel Type	Variant	Phase 1			Phase 2			Phase 3		
			Count	Avg. Diam (cm)	%total*	Count	Avg. Diam (cm)	%total	Count	Avg. Diam (cm)	%total
Storage	Jarras	A	-	-	-	8	10.5	57%	57	13.26	44%
		B1	-	-	-	-	-	-	1	16	1%
		B2	1	15	100%	5	13.67	36%	56	14.23	43%
		C2	-	-	-	1	10	7%	10	15.7	8%
		C3	-	-	-	-	-	-	5	15.8	4%
		Totals	1	15	3%	14	11.25	12%	129	14.05	22%
Storage	Cantaros	A1	-	-	-	-	-	-	20	20.2	69%
		A3	-	-	-	-	-	-	1	19	3%
		B2	-	-	-	-	-	-	8	19.86	28%
		Totals	-	-	-	-	-	-	29	20.07	5%
Storage	Botellas	A1	-	-	-	-	-	-	2	5.5	67%
		A2	-	-	-	-	-	-	1	7	33%
		Totals	-	-	-	-	-	-	3	6	1%
Other	Other	Adornos	-	-	-	-	-	-	-	-	4%
		Lids	-	-	-	2	-	29%	5	-	18%
		Tools	-	-	-	2	-	29%	4	-	14%
		Trumpets	-	-	-	1	-	14%	7	-	25%
		Incensarios	-	-	-	2	-	29%	9	-	32%
		Miniatures	-	-	-	-	-	-	1	-	4%
		Figurines	-	-	-	-	-	-	1	-	4%
		Totals	-	-	-	7	-	6%	28	-	5%

* %total refers to the percentage of the total number of sherds in a formal category (i.e. tazones, cantaros) in a given occupational phase; %total in **bold** refers to the percentage of the total number of sherds for which a form could be determined for a given occupational phase

APPENDIX F Key for Pottery Illustrations

Red	Light Red	Dark Red	Red- Brown	Brown	Light Brown	Dark Brown	Orange	Light Orange	Dark Orange	Gray	Black	White	Cream	Yellow- Cream
7.5R 3/8	7.5R 4/2	5YR 2.5/2	2.5YR 3/4	5YR 3/4	2.5Y 5/2	2.5YR 3/3	5YR 6/8	2.5YR 5/6	2.5YR 4/8	2.5YR 3/1	2.5YR 5/1	2.5Y 8/1	2.5Y 7/1	2.5Y 6/4
7.5R 4/8	7.5R 4/3	7.5R 2.5/4	2.5YR 3/6	5YR 4/1	2.5Y 6/2	2.5YR 3/4	2.5YR 6/3	2.5YR 6/3	2.5YR 5/8	2.5YR 4/1	2.5YR 5/2	2.5Y 8/2	2.5Y 7/3	2.5Y 7/2
7.5R 5/8	7.5R 4/4	7.5R 2.5/4	2.5YR 4/3	5YR 4/2	2.5Y 6/3	2.5YR 3/4	10R 5/8	2.5YR 6/4	2.5YR 6/6	2.5YR 4/1	2.5YR 5/2	2.5Y 8/4	2.5Y 7/4	2.5Y 7/4
10R 4/6	7.5R 4/6	7.5R 3/4	2.5YR 4/4	5YR 4/3	2.5Y 7/6	5YR 3/2	5YR 6/3	5YR 6/3	2.5YR 6/8	7.5YR 3/1	5YR 5/1	10YR 7/2	10YR 7/2	2.5Y 8/3
10R 5/4	10R 3/3	7.5R 3/6	2.5YR 4/6	5YR 4/4	2.5YR 4/2	5YR 3/3	5YR 6/4	5YR 6/6	5YR 5/8	7.5YR 4/1	5YR 5/2	10YR 7/3	10YR 7/3	2.5Y 8/4
10R 5/6	10R 3/4	7.5R 3/2	2.5YR 5/2	5YR 4/6	5YR 5/2	7.5YR 3/2	5YR 6/6	5YR 6/6	5YR 7/4	10YR 4/1	5YR 3/1	5Y 8/3	10YR 7/4	10YR 8/3
	10R 4/2	7.5R 3/3	2.5YR 5/3	5YR 5/4	5YR 5/2	7.5YR 3/3	5YR 7/4	5YR 7/6	10R 4/8	10YR 5/1	5YR 5/2	10YR 8/3	10YR 8/3	7.5YR 8/3
	10R 4/4	7.5R 3/4	2.5YR 5/4	5YR 5/4	5YR 5/3	7.5YR 3/3	5YR 7/6	5YR 7/6	10YR 5/2	10YR 5/2	10YR 2/1	10YR 8/4	10YR 8/4	10YR 7/6
		10R 3/2	7.5YR 4/3	5YR 5/3	7.5YR 4/4	7.5YR 3/4	5YR 7/8	5YR 7/8	10YR 6/1	10YR 6/1	10YR 3/1	5YR 8/1	5YR 8/1	10YR 8/6
		10R 3/6	7.5YR 4/6	5YR 5/6	7.5YR 4/6	10YR 3/2	7.5YR 6/6	7.5YR 6/6	7.5YR 6/6	7.5YR 6/6	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
		10R 4/3	7.5YR 5/6	7.5YR 5/6	7.5YR 4/2	10YR 3/2	7.5YR 5/1	7.5YR 6/8	7.5YR 6/8	7.5YR 6/8	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 5/1	7.5YR 5/1	7.5YR 5/1	10YR 3/2	7.5YR 5/2	7.5YR 6/8	7.5YR 6/8	7.5YR 6/8	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 5/2	7.5YR 5/2	7.5YR 5/2	10YR 3/2	7.5YR 5/3	7.5YR 7/3	7.5YR 7/3	7.5YR 7/3	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 5/3	7.5YR 5/3	7.5YR 5/3	10YR 3/2	7.5YR 5/4	7.5YR 7/4	7.5YR 7/4	7.5YR 7/4	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 5/4	7.5YR 5/4	7.5YR 5/4	10YR 3/2	7.5YR 5/4	7.5YR 7/6	7.5YR 7/6	7.5YR 7/6	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 6/2	7.5YR 6/2	7.5YR 6/2	10YR 3/2	7.5YR 6/2	7.5YR 6/8	7.5YR 6/8	7.5YR 6/8	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 6/3	7.5YR 6/3	7.5YR 6/3	10YR 3/2	7.5YR 6/3	7.5YR 5/8	7.5YR 5/8	7.5YR 5/8	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			7.5YR 6/4	7.5YR 6/4	7.5YR 6/4	10YR 3/2	7.5YR 6/4	7.5YR 5/8	7.5YR 5/8	7.5YR 5/8	7.5YR 8/1	7.5YR 8/1	10YR 8/8	10YR 8/8
			10YR 4/2	10YR 4/2	10YR 4/2	10YR 3/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2
			10YR 4/3	10YR 4/3	10YR 4/3	10YR 3/2	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3
			10YR 4/4	10YR 4/4	10YR 4/4	10YR 3/2	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4
			10YR 5/2	10YR 5/2	10YR 5/2	10YR 3/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2
			10YR 5/3	10YR 5/3	10YR 5/3	10YR 3/2	10YR 5/3	10YR 5/3	10YR 5/3	10YR 5/3	10YR 5/3	10YR 5/3	10YR 5/3	10YR 5/3
			10YR 5/4	10YR 5/4	10YR 5/4	10YR 3/2	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4
			10YR 5/6	10YR 5/6	10YR 5/6	10YR 3/2	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6
			10YR 6/2	10YR 6/2	10YR 6/2	10YR 3/2	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2	10YR 6/2
			10YR 6/3	10YR 6/3	10YR 6/3	10YR 3/2	10YR 6/3	10YR 6/3	10YR 6/3	10YR 6/3	10YR 6/3	10YR 6/3	10YR 6/3	10YR 6/3
			10YR 6/4	10YR 6/4	10YR 6/4	10YR 3/2	10YR 6/4	10YR 6/4	10YR 6/4	10YR 6/4	10YR 6/4	10YR 6/4	10YR 6/4	10YR 6/4
			10YR 6/6	10YR 6/6	10YR 6/6	10YR 3/2	10YR 6/6	10YR 6/6	10YR 6/6	10YR 6/6	10YR 6/6	10YR 6/6	10YR 6/6	10YR 6/6

Appendix G Pottery Illustrations

1. Formative Phase 1

1.1 Serving

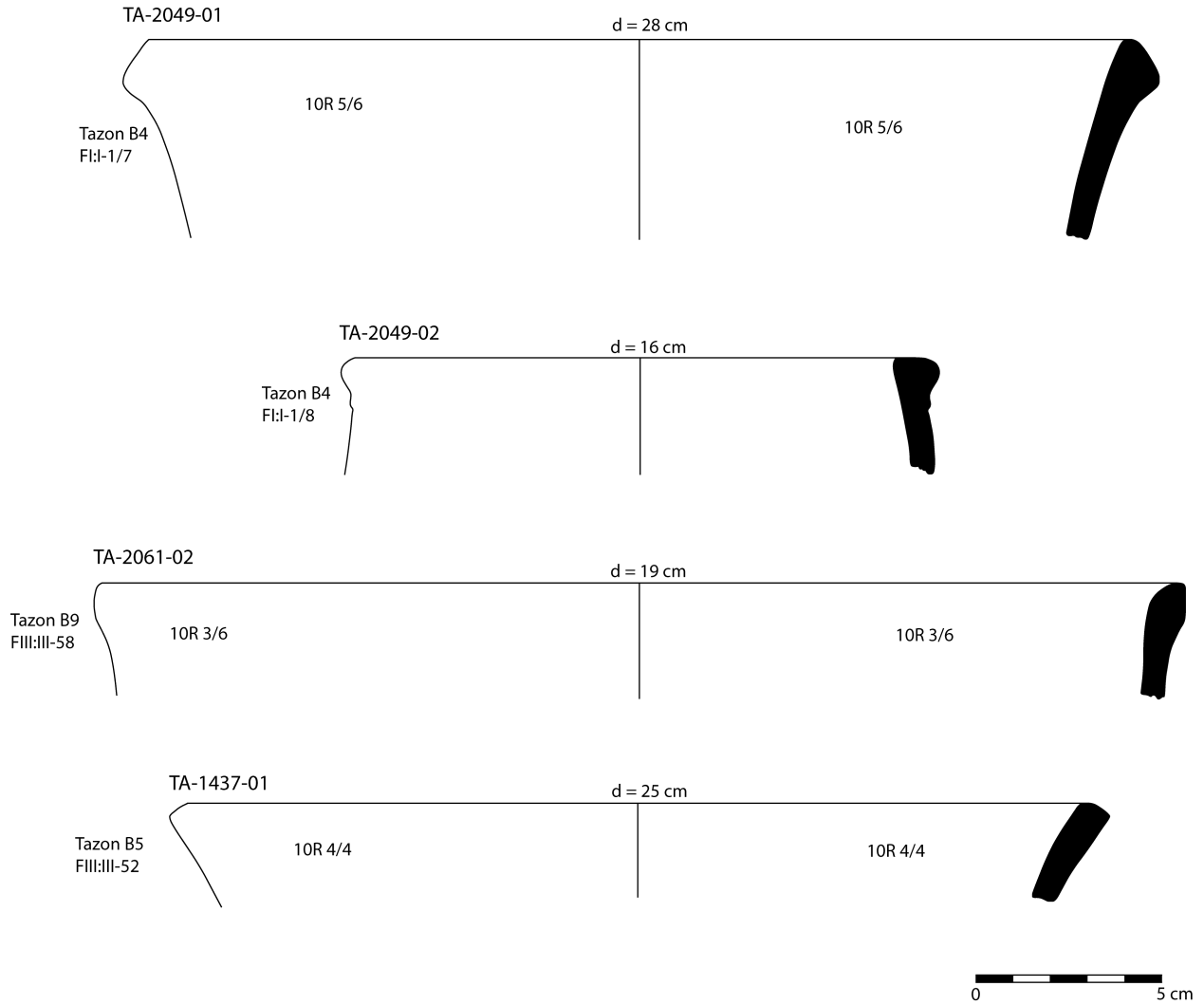


Figure G.1. *Tazones*, Formative Phase 1

1.2 Cooking

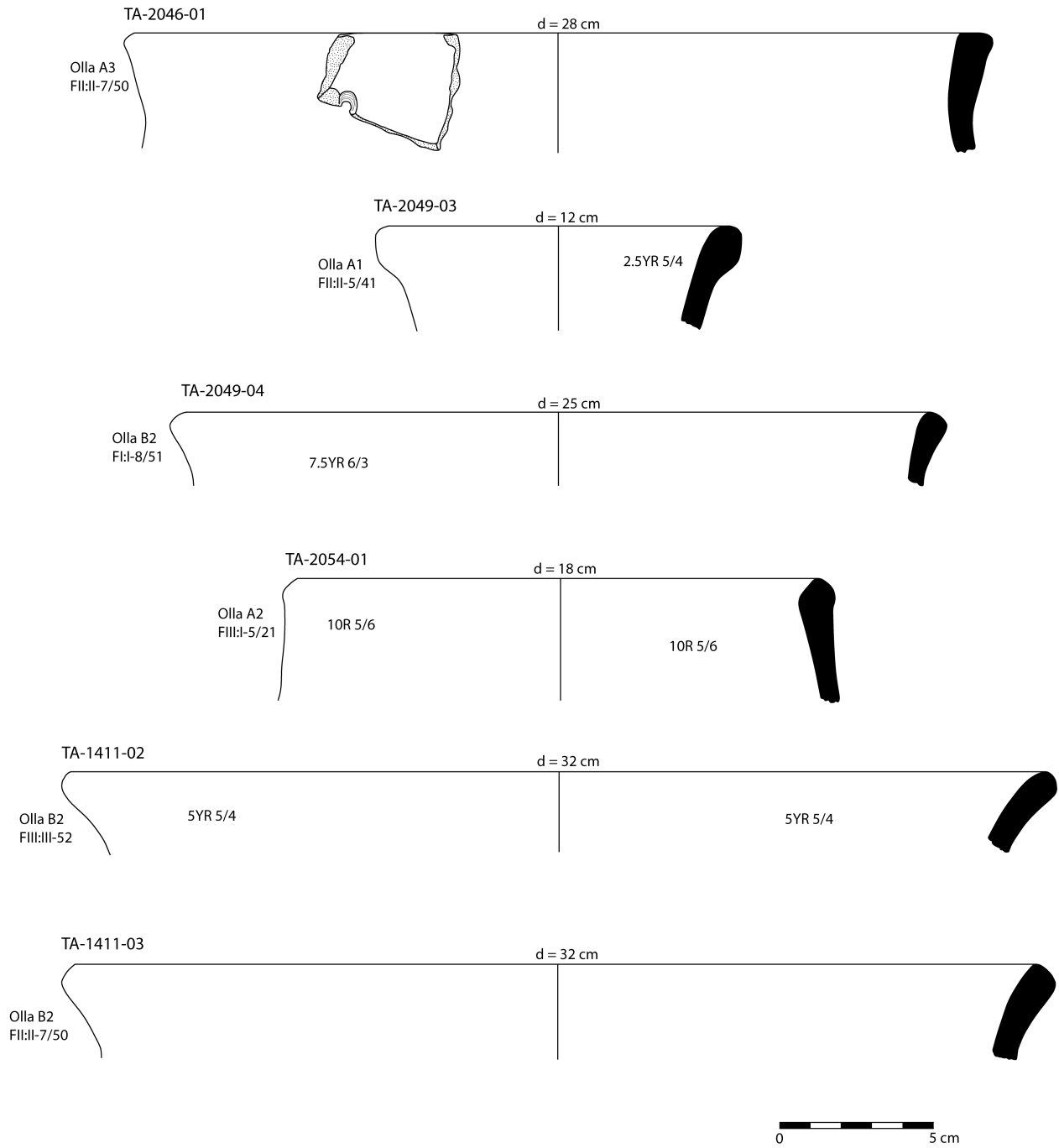


Figure G.2. Necked *Ollas* (Types A and B), Formative Phase 1

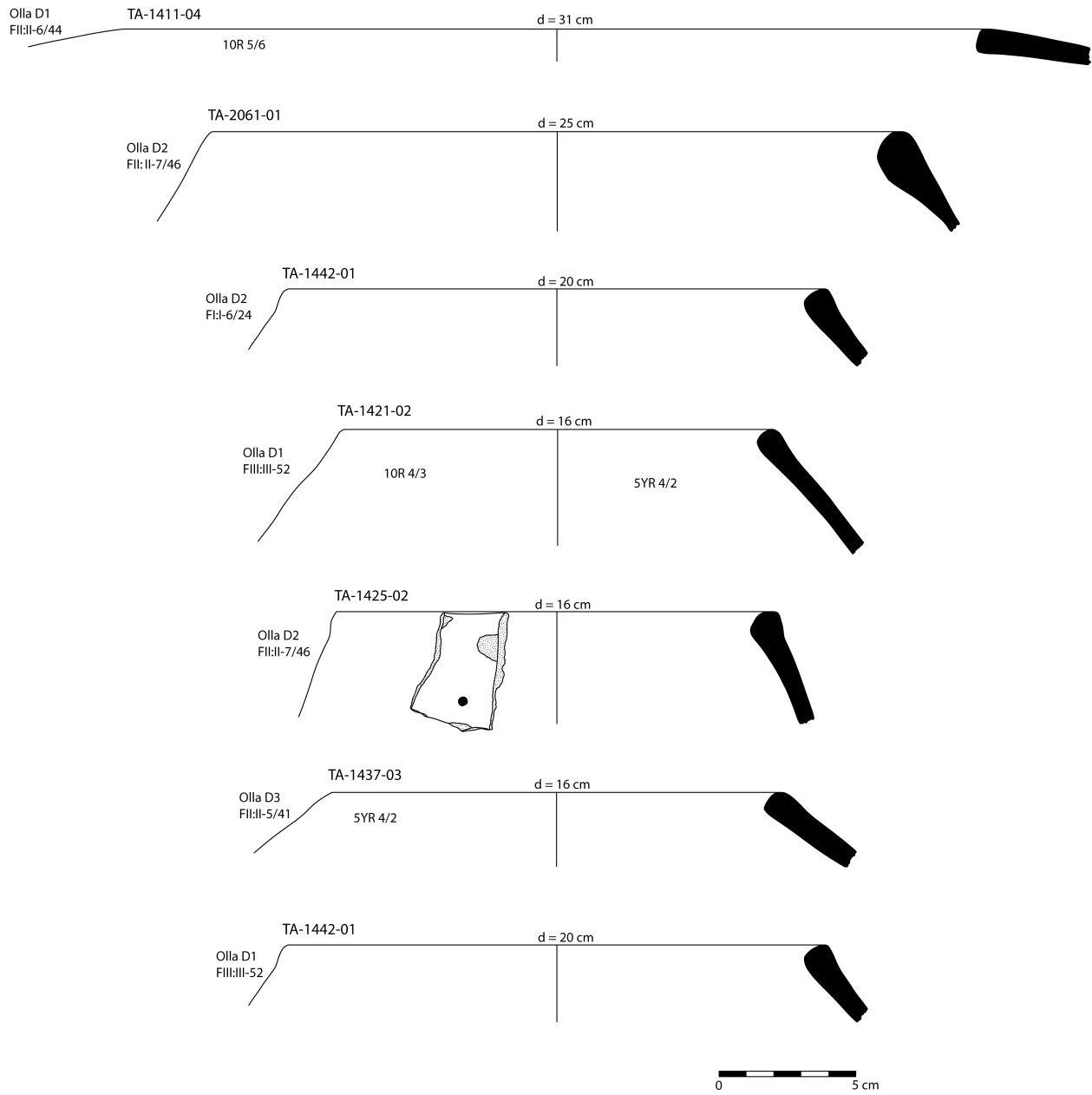


Figure G.3. Neckless *Ollas* (Type D), Formative Phase I

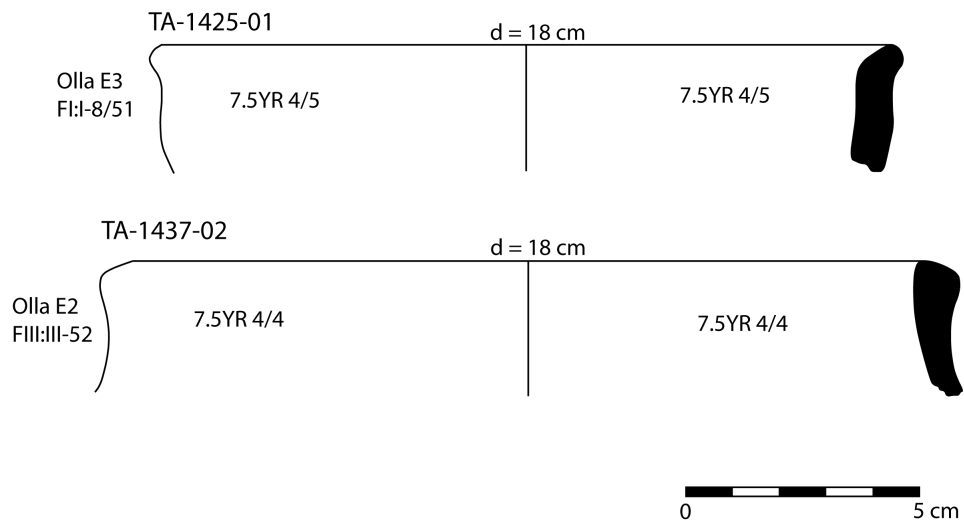


Figure G.4. Short-necked *Ollas* (Type E), Formative Phase 1

1.3 Storage

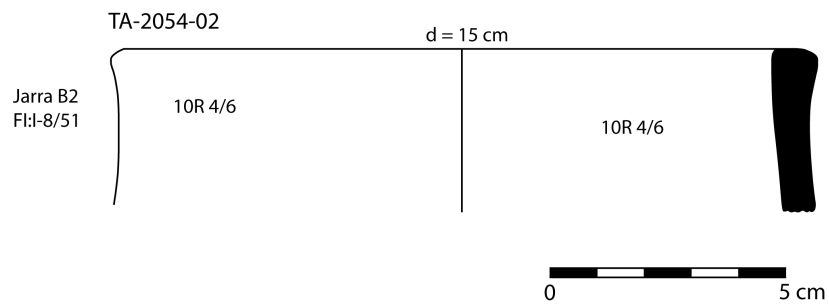


Figure G.5. *Jarra*, Formative Phase 1

1.4 Decorated Body Sherds

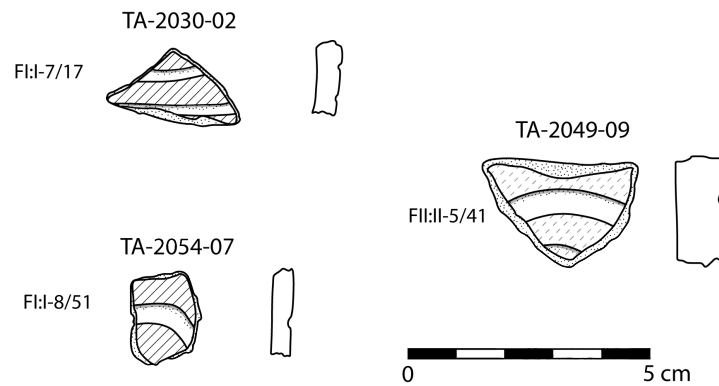


Figure G.6. Wide-line incised body sherds, Formative Phase 1

2. Formative Phase 2

2.1 Servings

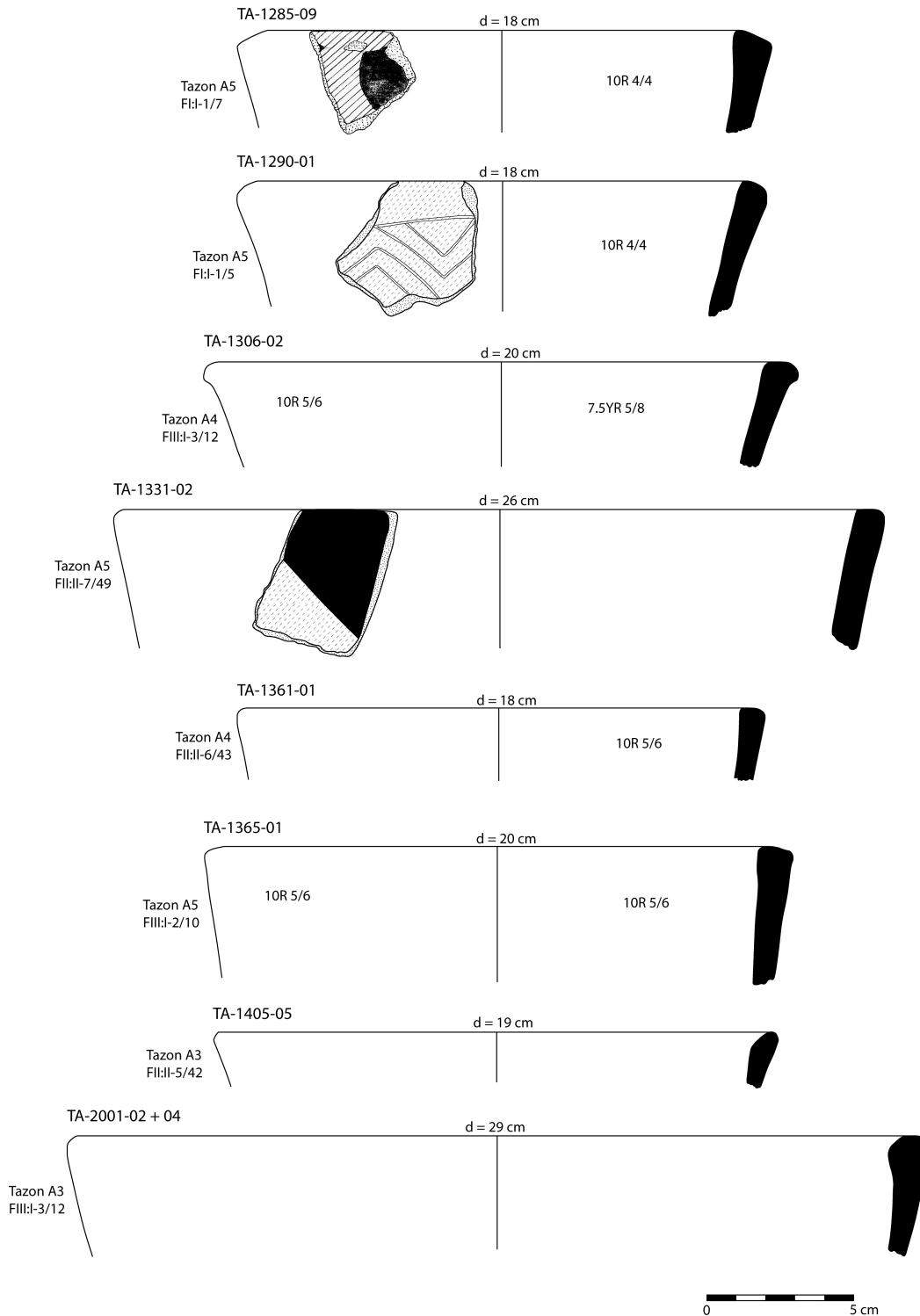


Figure G.7. Tazones (Type A), Formative Phase 2

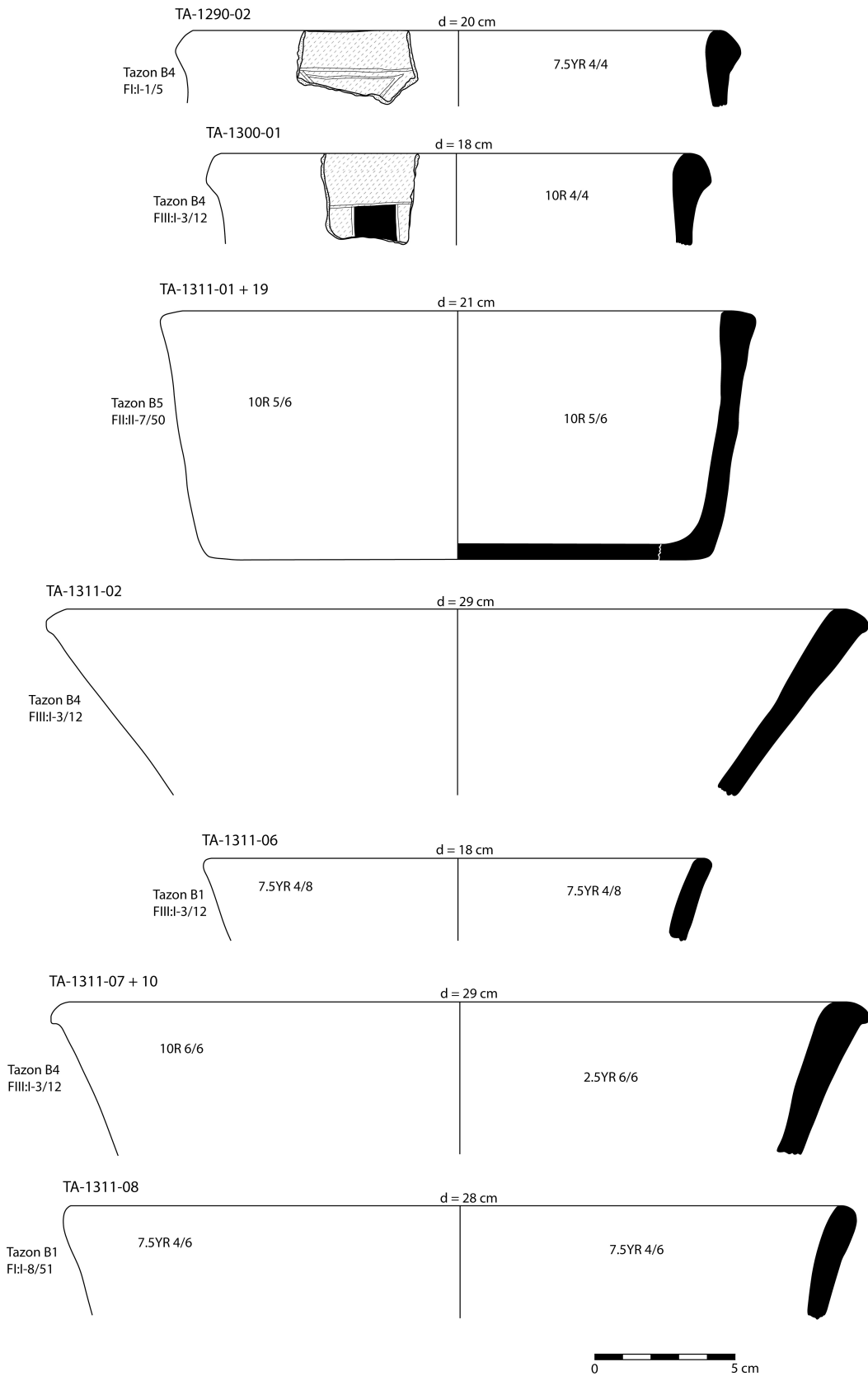


Figure G.8. *Tazones* (Type B), Formative Phase 2

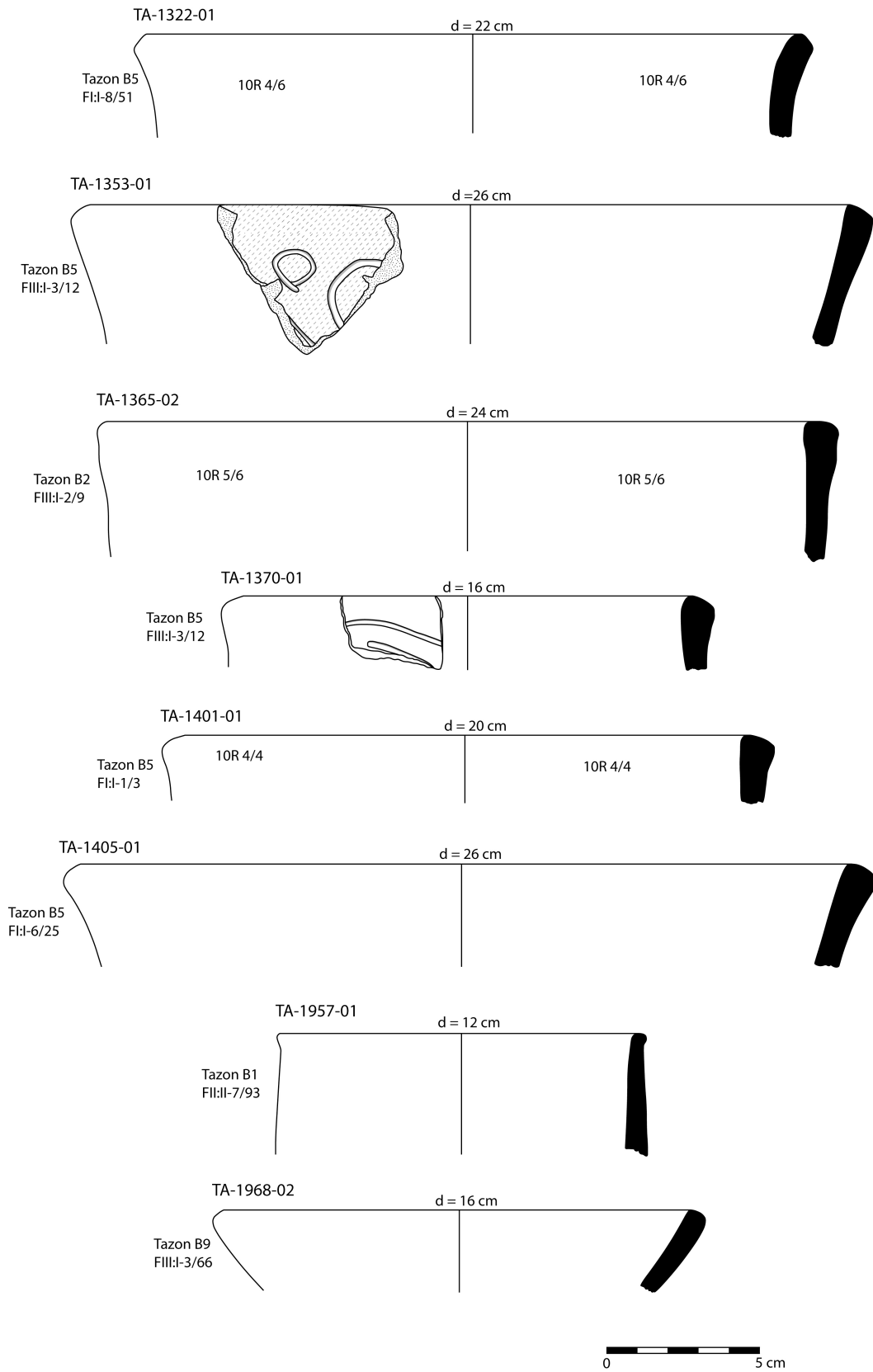


Figure G.9. *Tazones* (Type B), Formative Phase 2

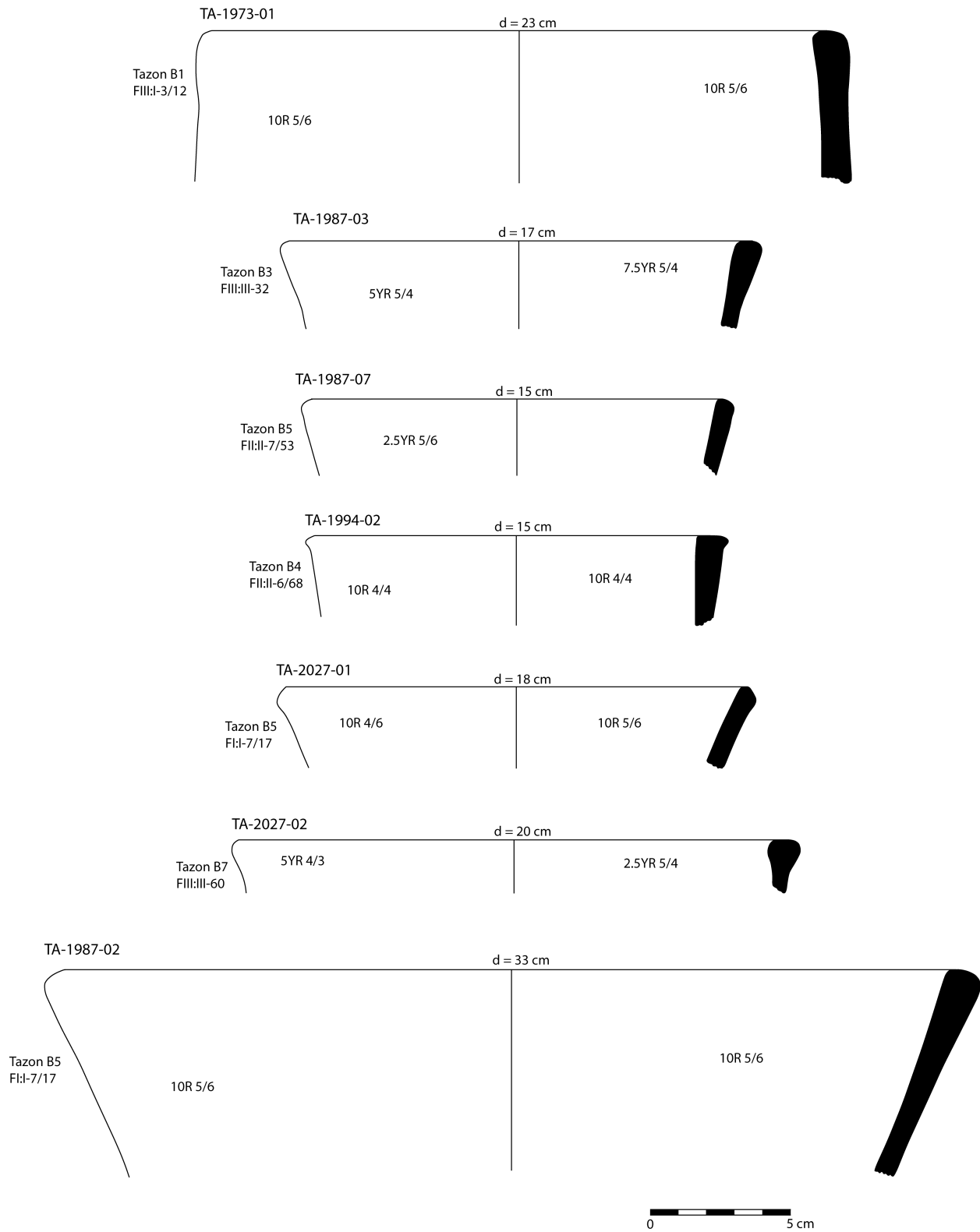


Figure G.10. Tazones (Type B), Formative Phase 2

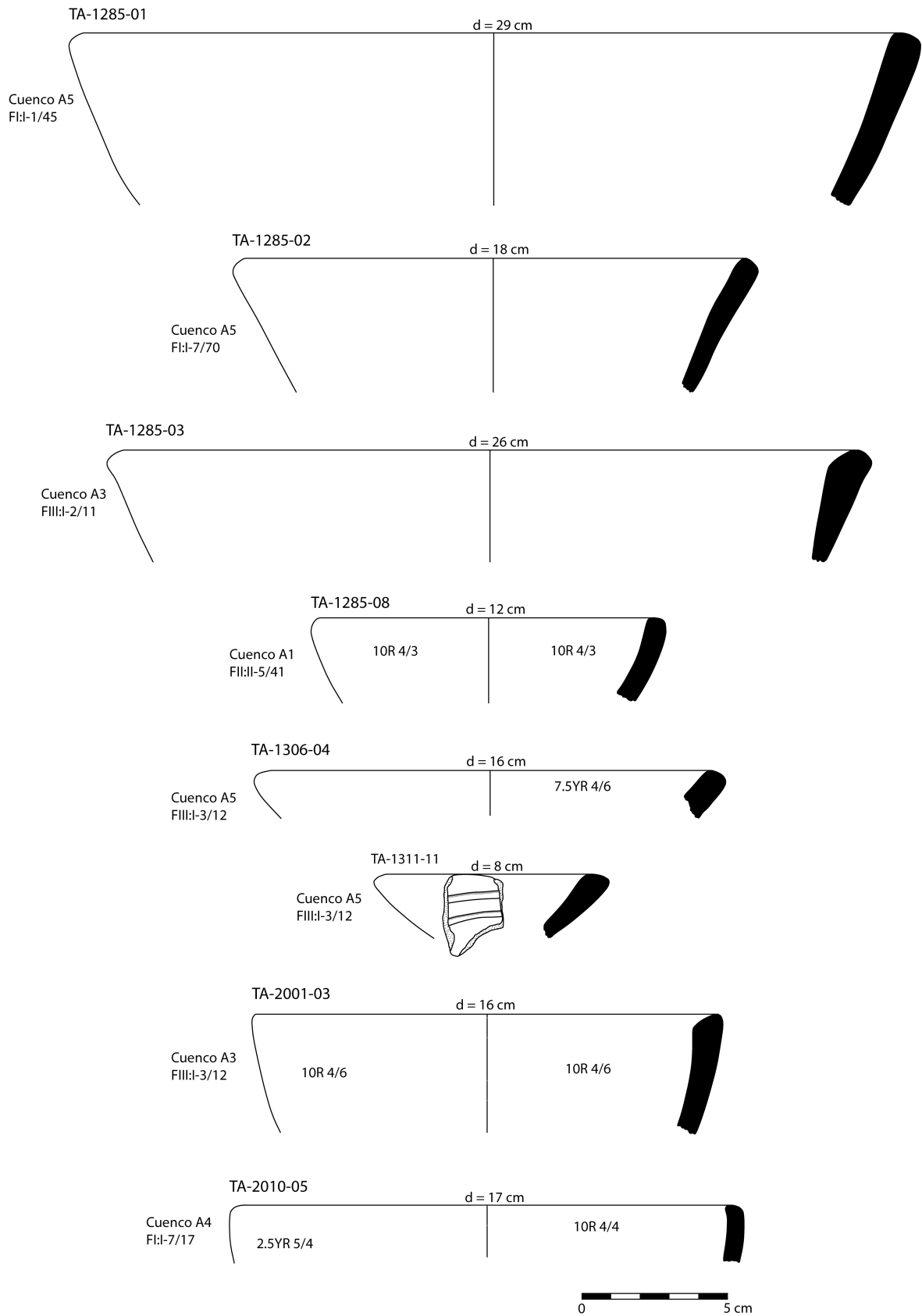


Figure G.11. Cuencos (Type A), Formative Phase 2

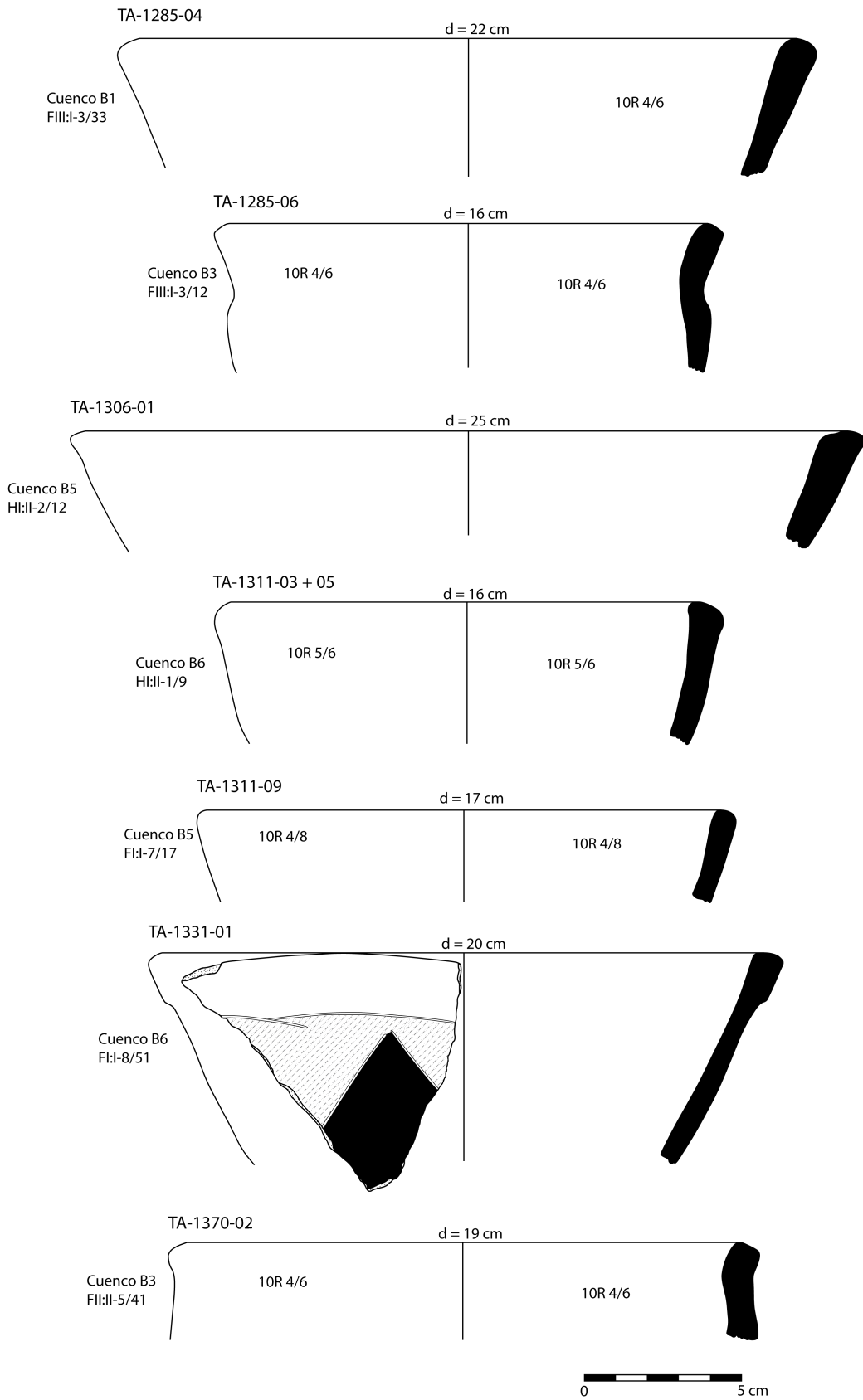


Figure G.12. *Cuencos* (Type B), Formative Phase 2

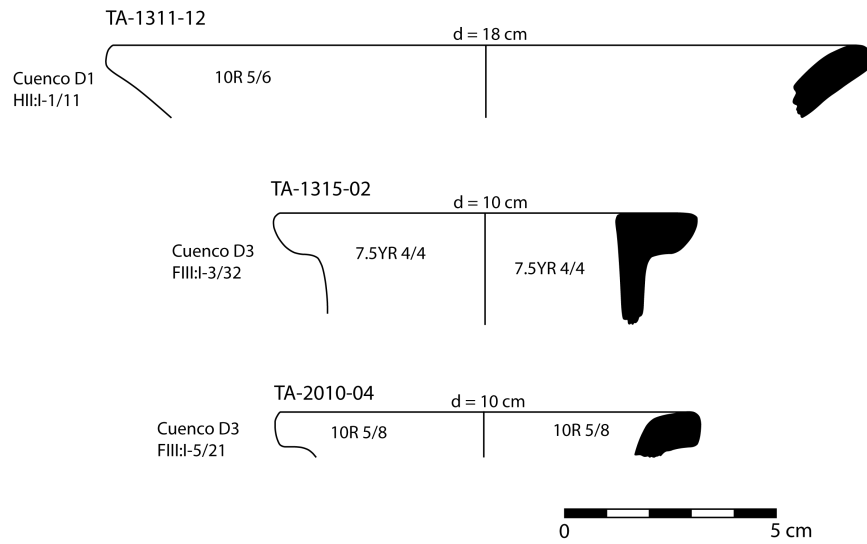


Figure G.13. *Cuencos* (Type D), Formative Phase 2

2.2 Cooking

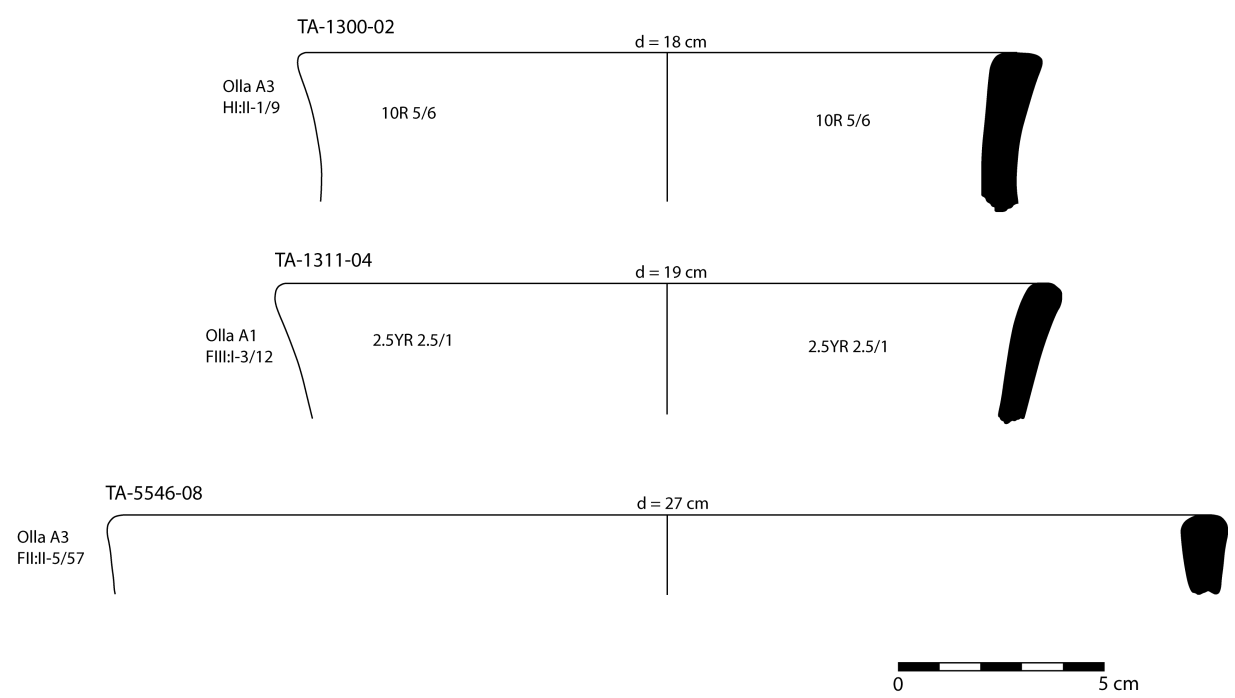


Figure G.14. Necked *Ollas* (Type A), Formative Phase 2

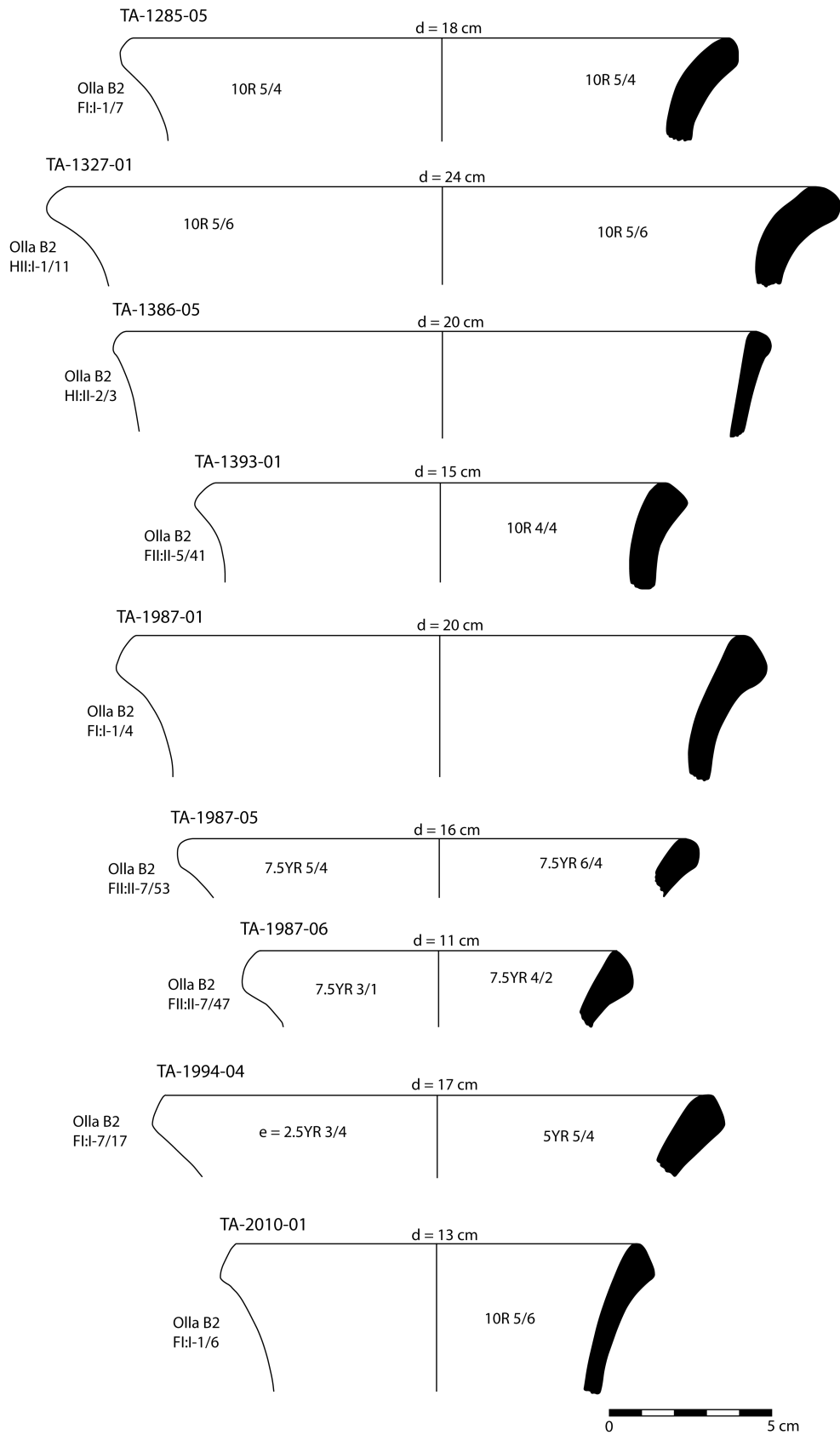


Figure G.15. Necked Ollas (Type B), Formative Phase 2

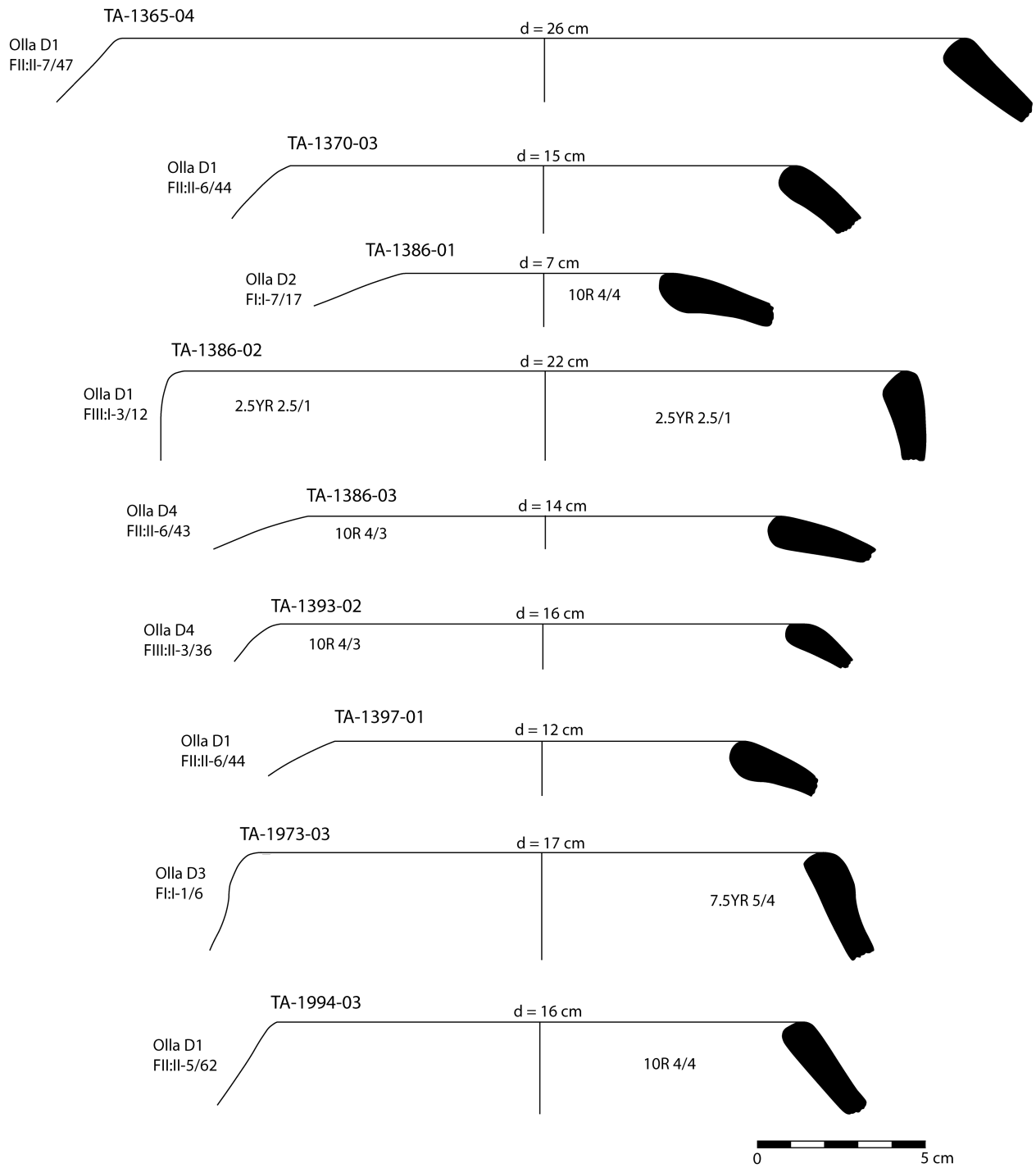


Figure G.16. Neckless *Ollas* (Type D), Formative Phase 2

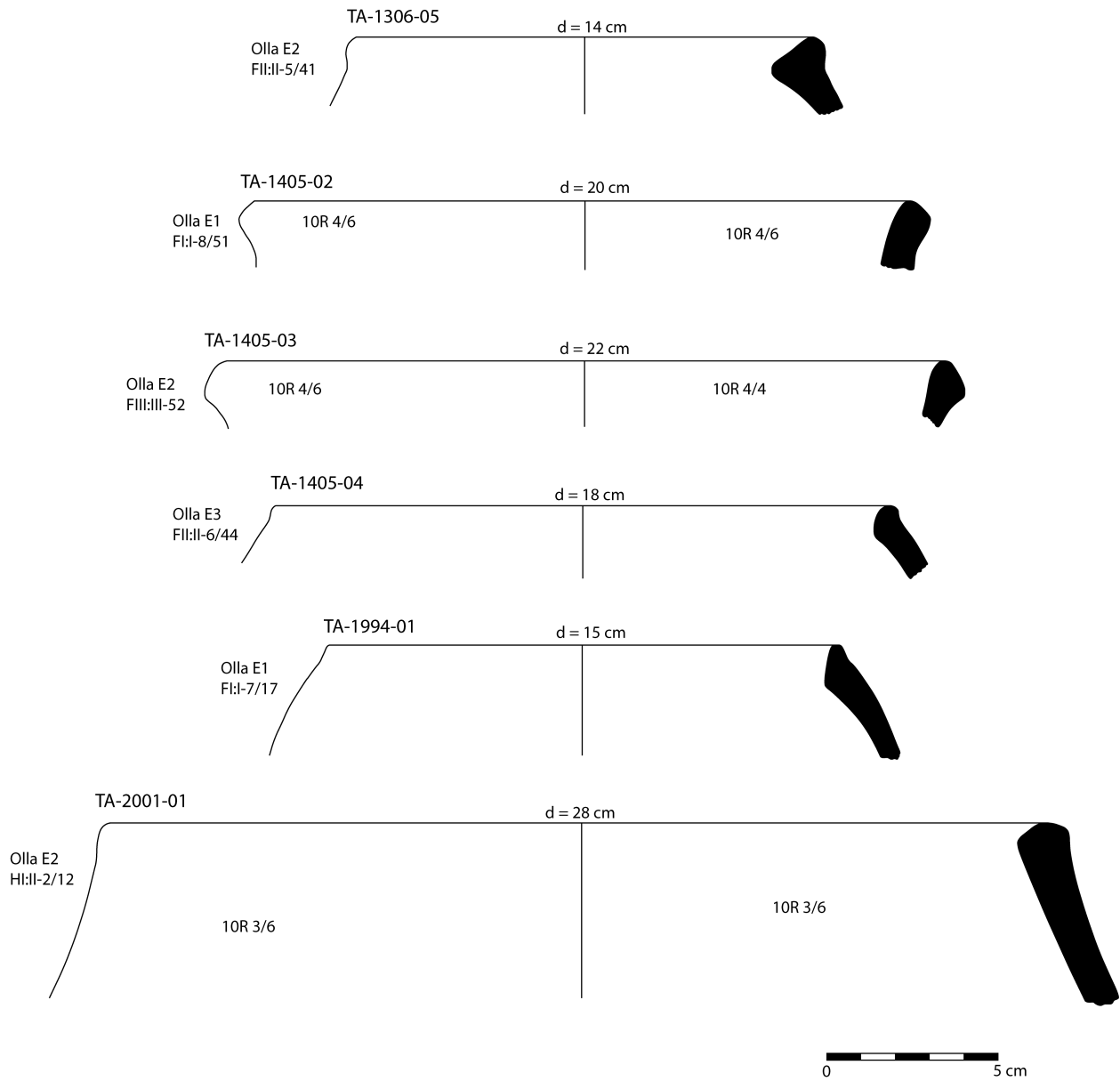


Figure G.17. Short-necked *Ollas* (Type E), Formative Phase 2

2.3 Storage

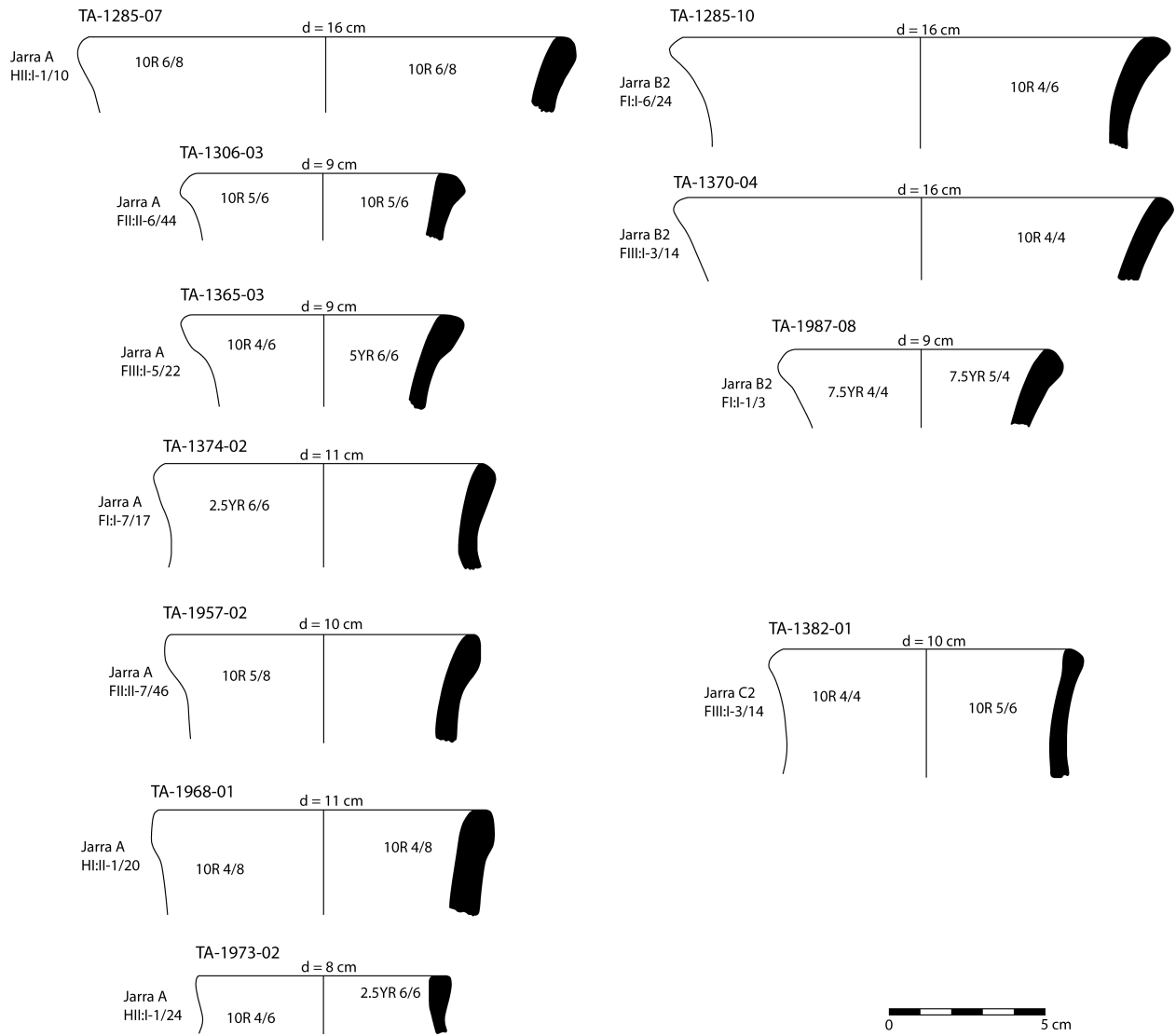


Figure G.18. Jarras (Types A, B, and C), Formative Phase 2

2.4 Non-Domestic Forms

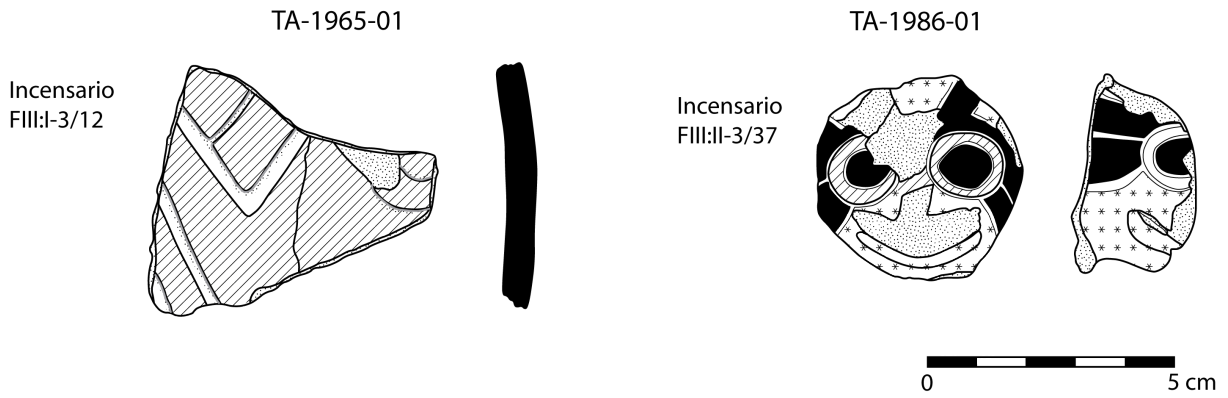


Figure G.19. Wide-line (left) and zone-incised polychrome (right) *incensario* fragments, Formative Phase 2

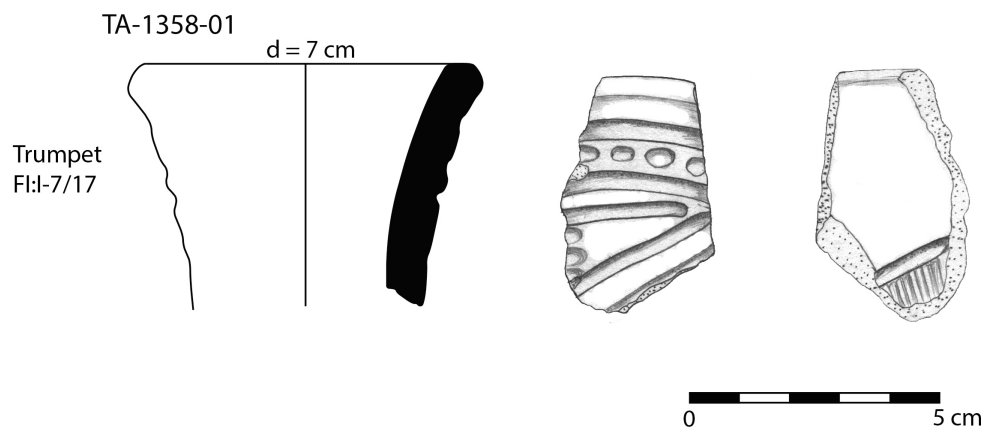


Figure G.20. Trumpet with wide line-incision and punctate decoration, Formative Phase 2

2.5 Decorated Body Sherds

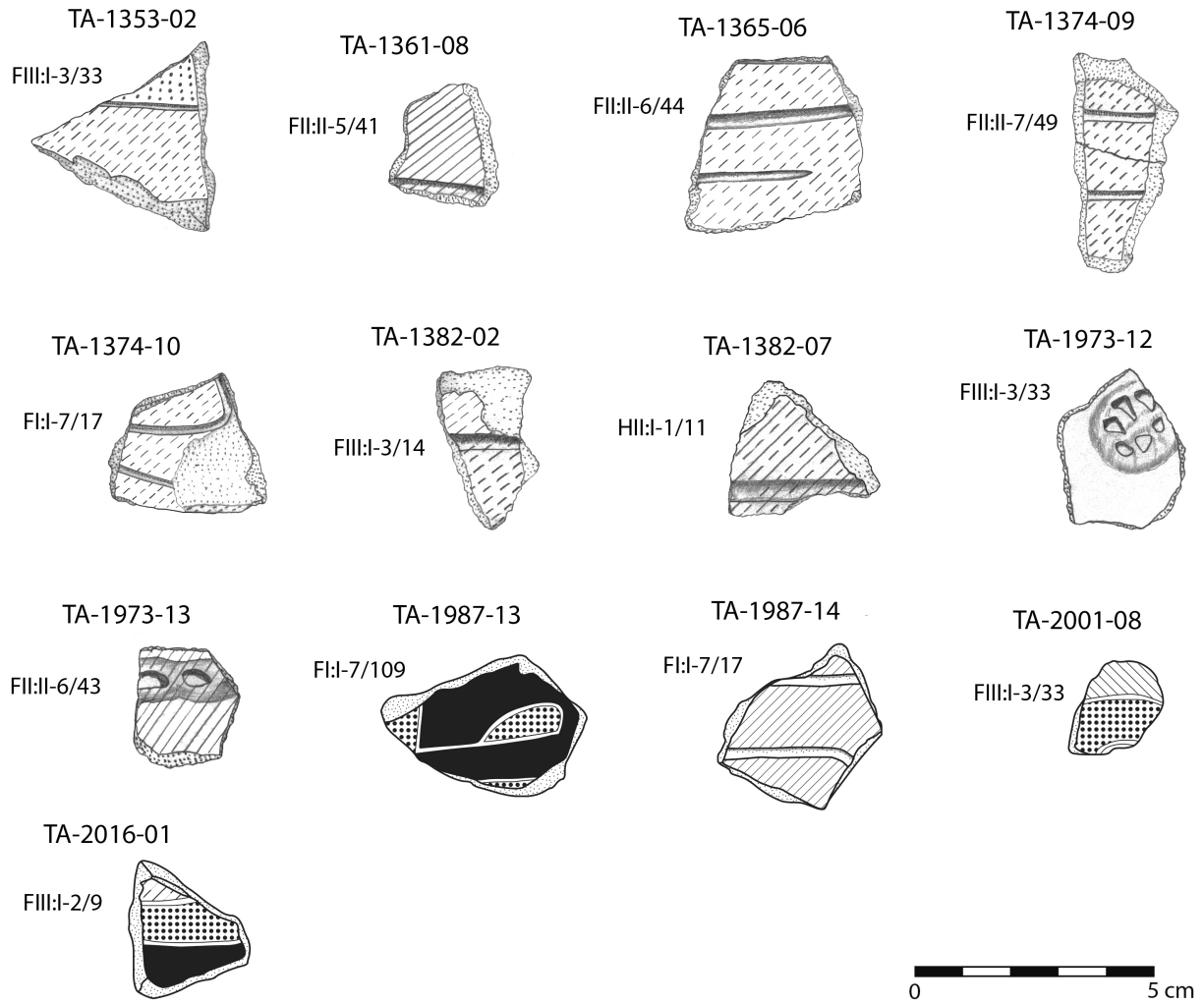


Figure G.21. Body sherds with incised, punctate, and polychrome decoration, Formative Phase 2

3. Formative Phase 3

3.1 Servings

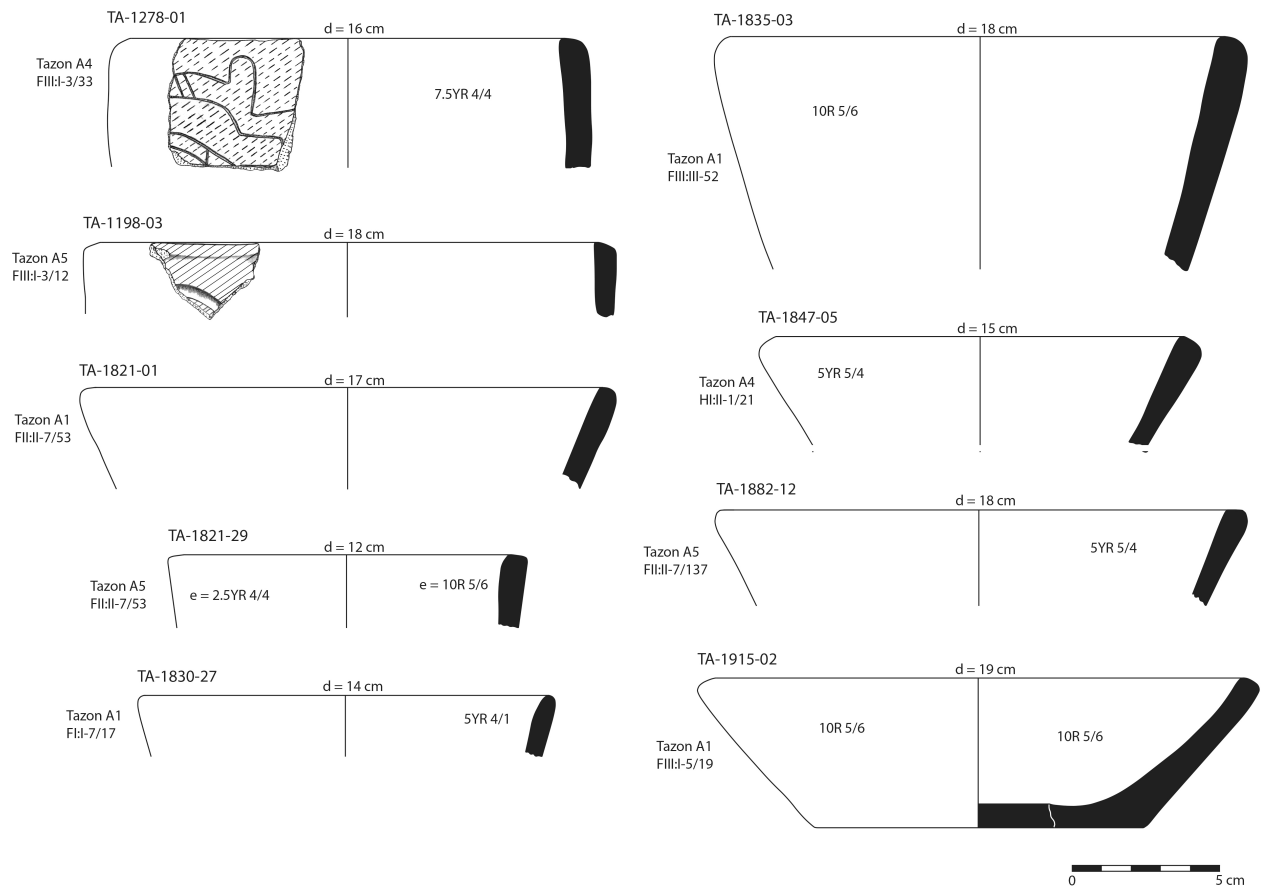


Figure G.22. Selected *Tazones* (Type A), Formative Phase 3

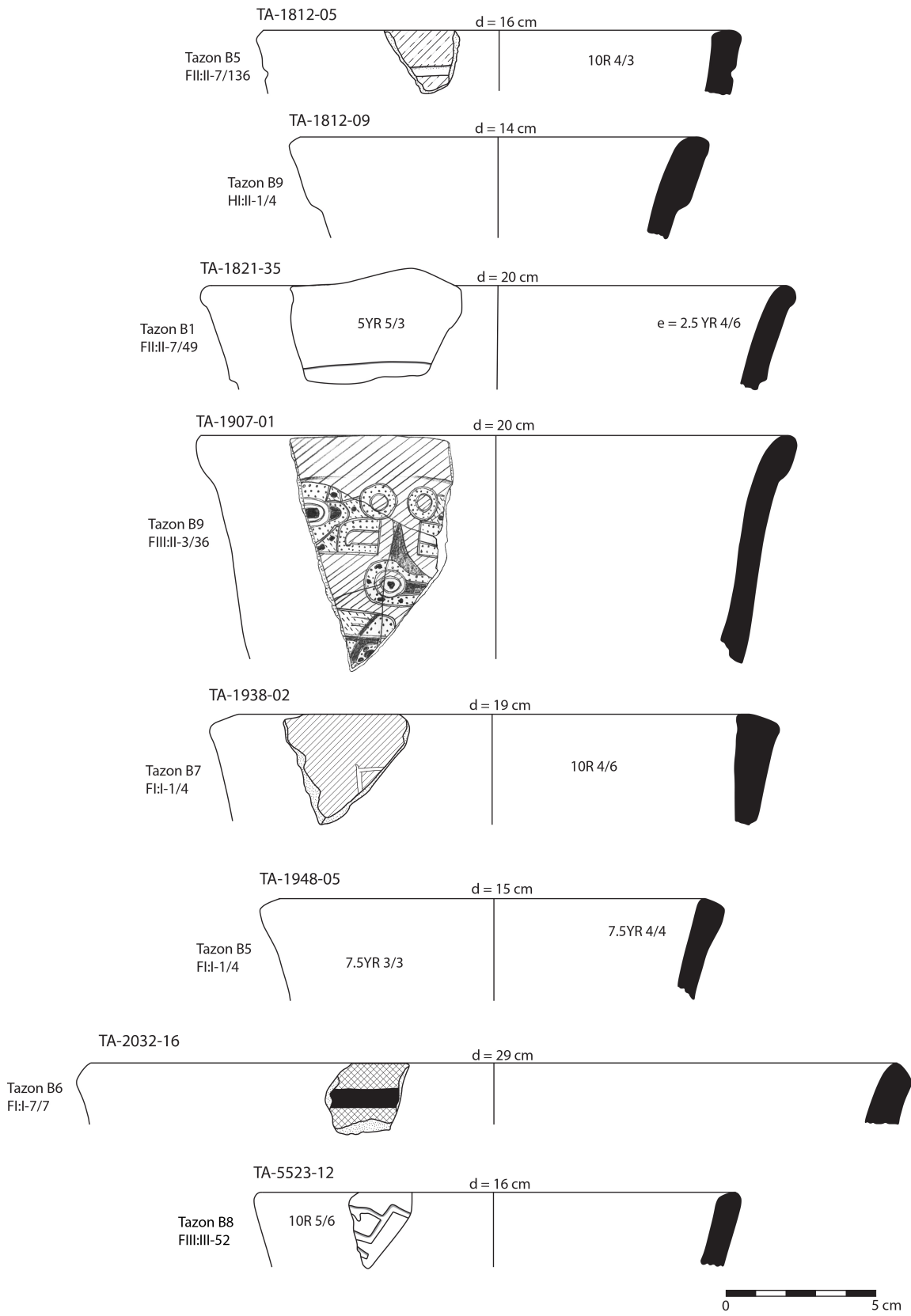


Figure G.23. Selected *Tazones* (Type B), Formative Phase 3

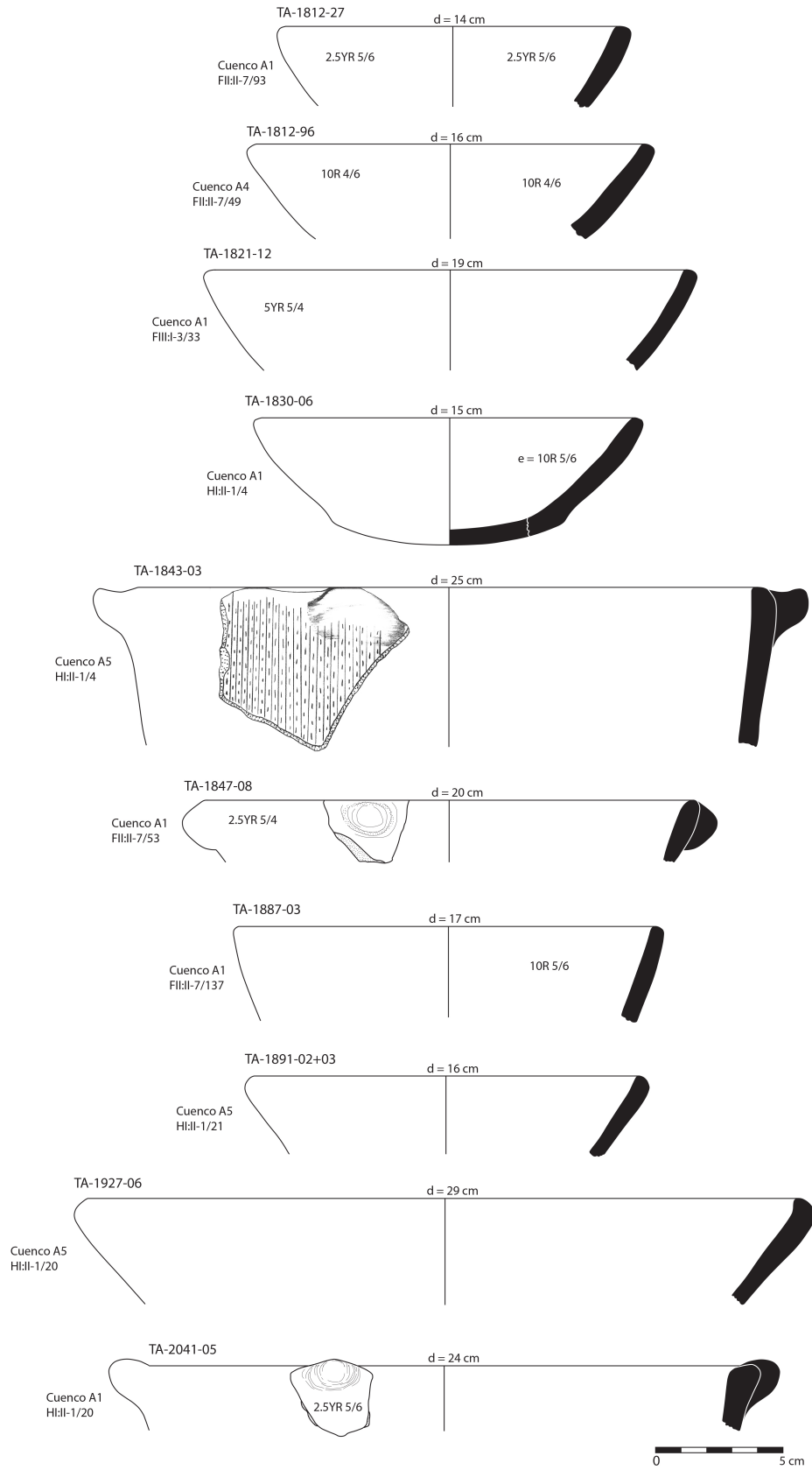


Figure G.24. Selected *Cuencos* (Type A), Formative Phase 3

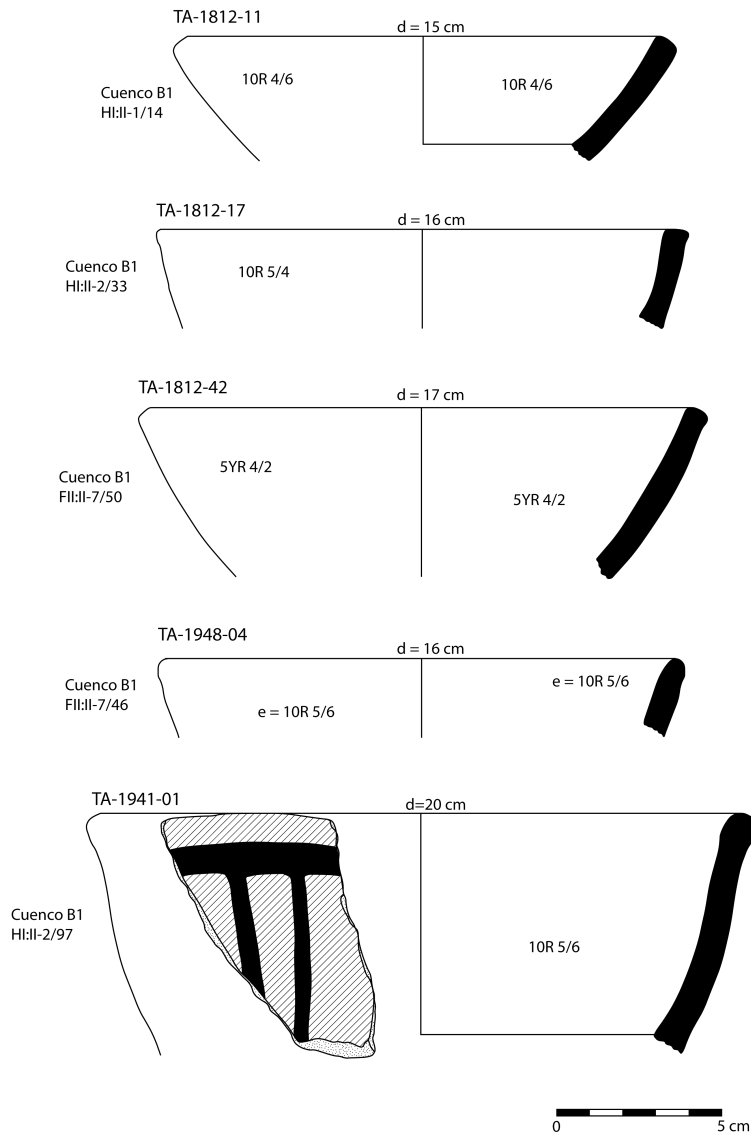


Figure G.25. Selected *Cuencos* (Type B), Formative Phase 3

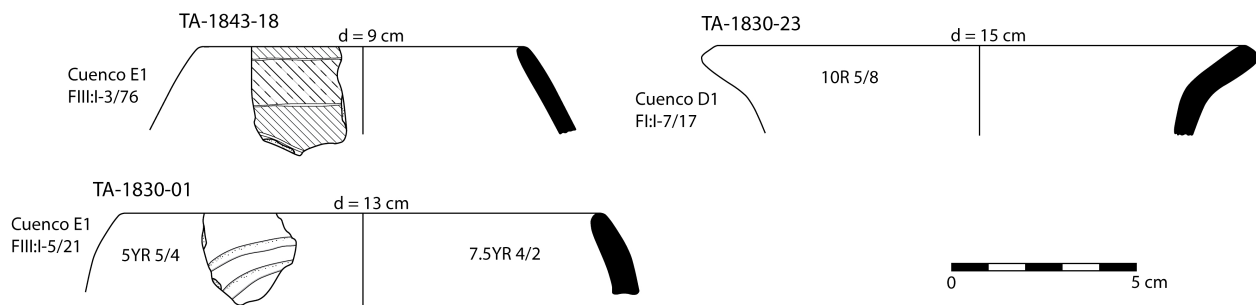


Figure G.26. *Cuencos* Type D (right) and E (left), Formative Phase 3

3.2 Cooking

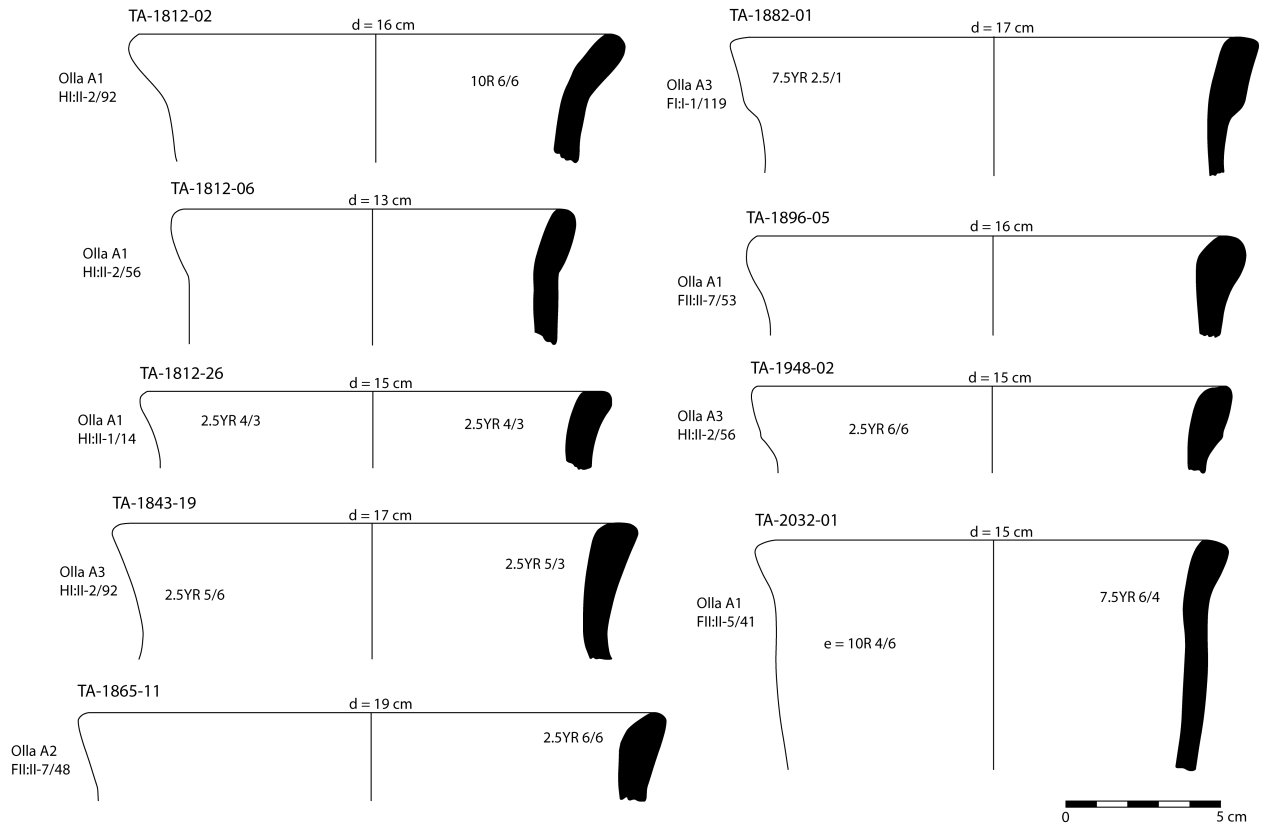


Figure G.27. Selected necked *Ollas* (Type A), Formative Phase 3

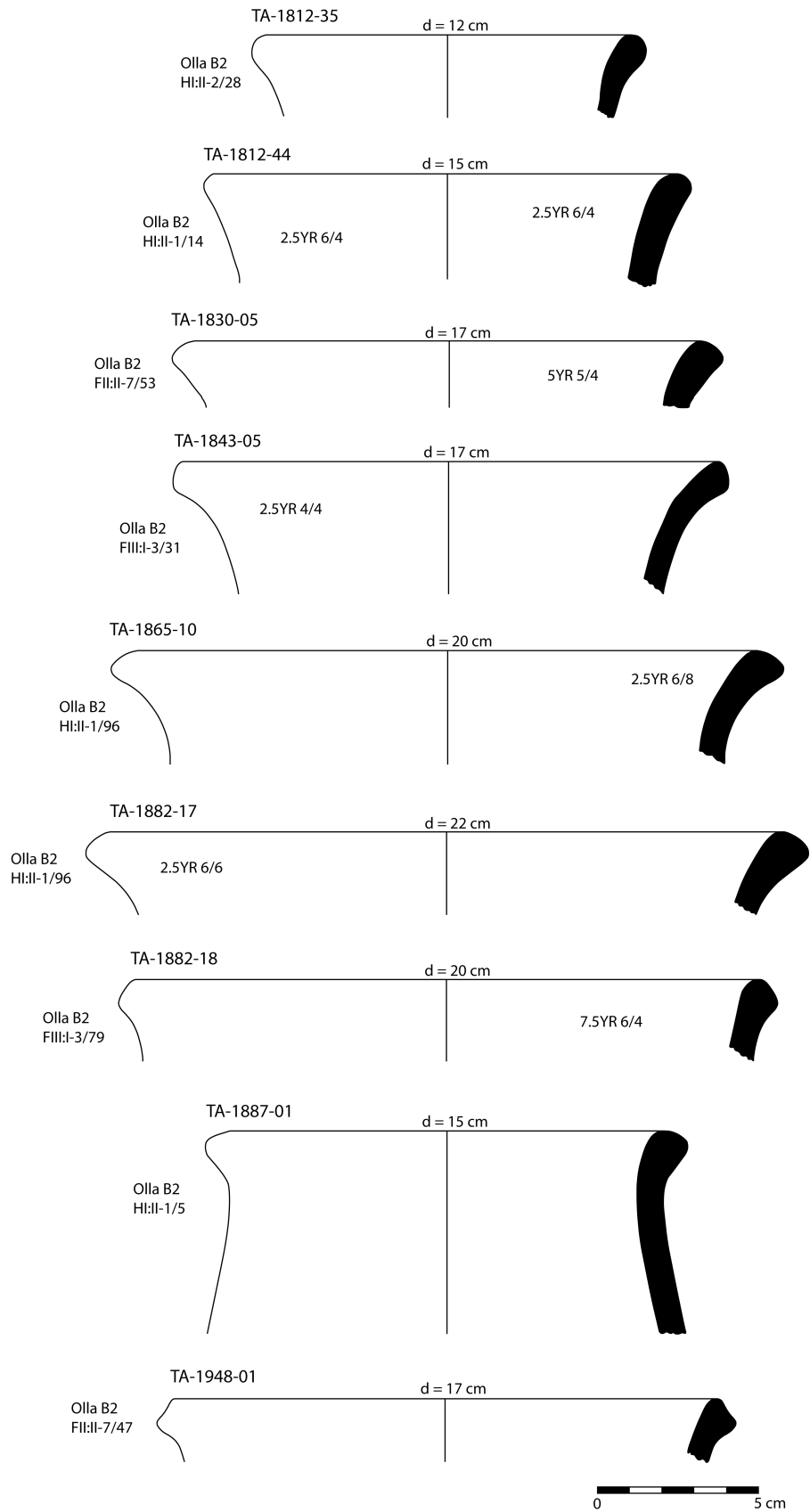


Figure G.28. Selected necked *Ollas* (Type B), Formative Phase 3

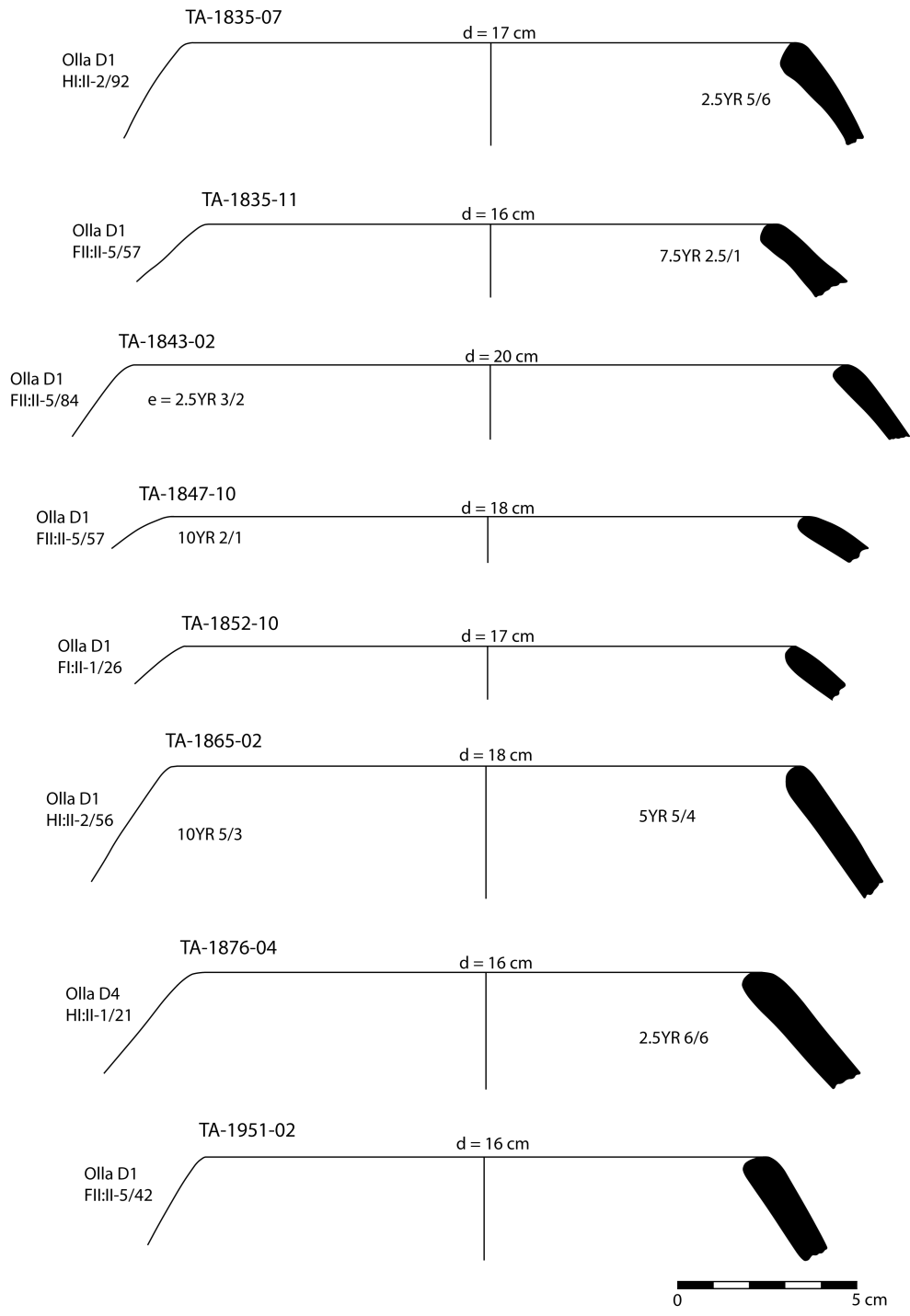


Figure G.29. Neckless *Ollas* (Type D), Formative Phase 3

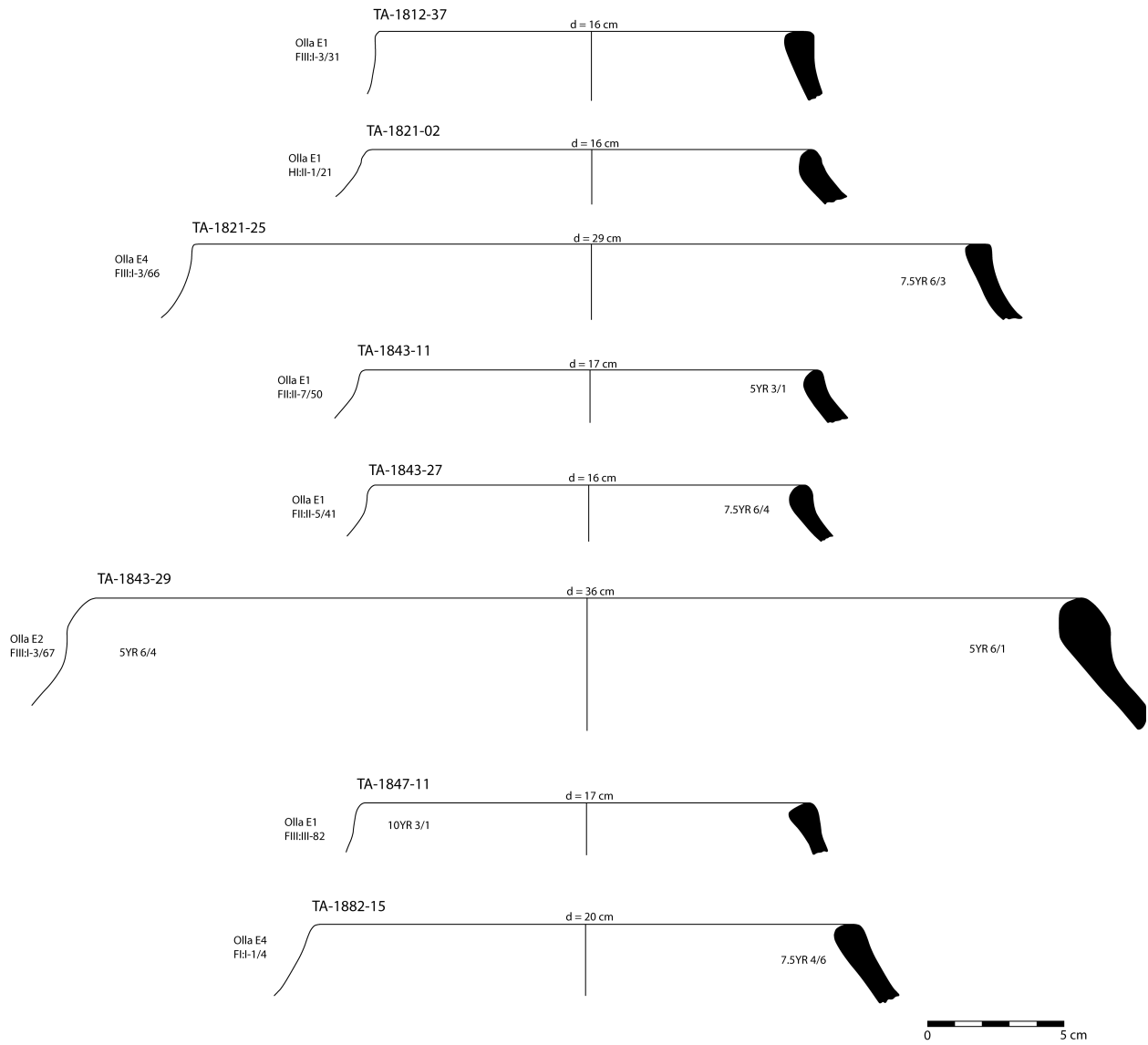


Figure G.30. Short-necked *Ollas* (Type E), Formative Phase 3

3.3 Storage

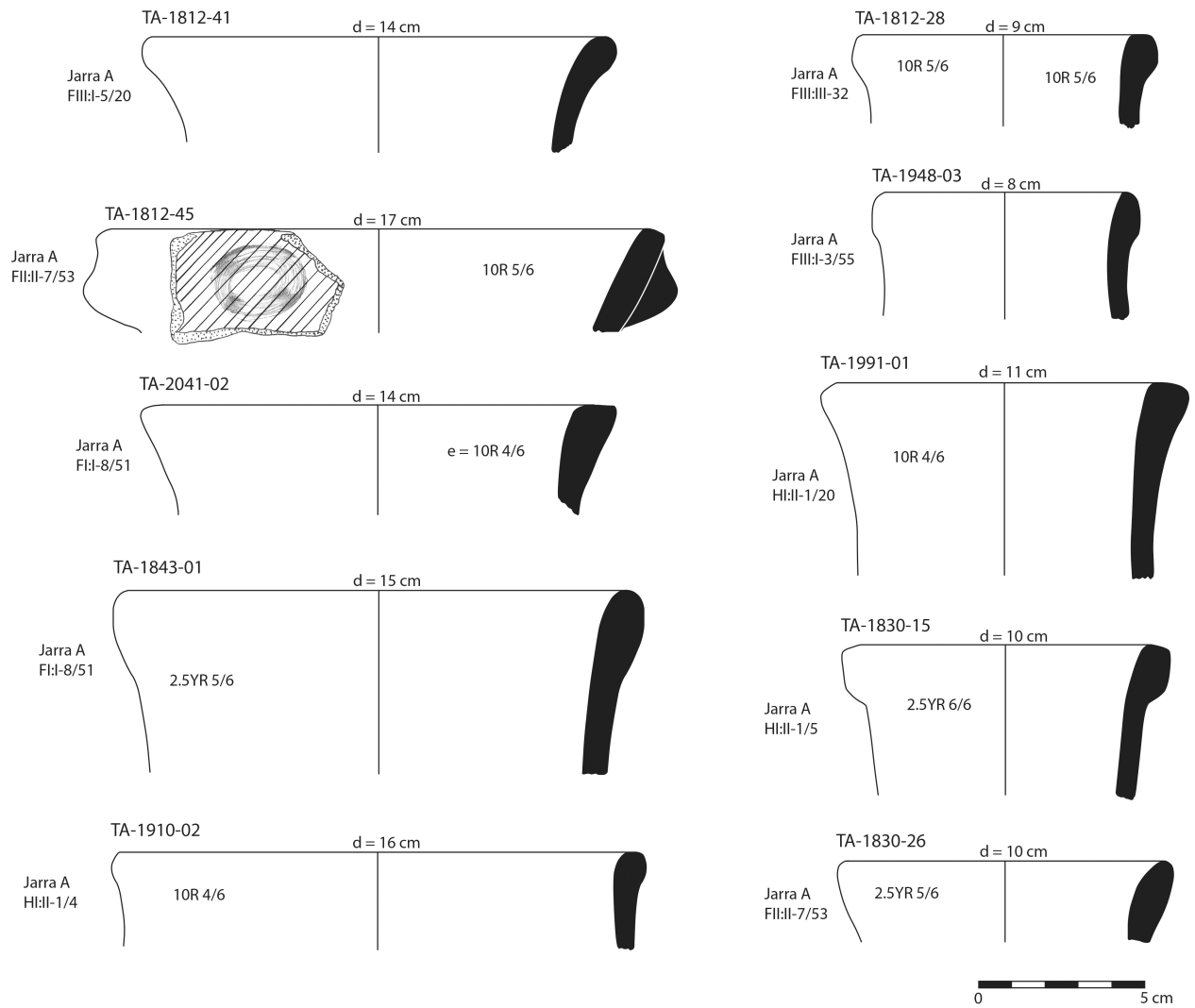


Figure G.31. Selected *Jarras* (Type A), Formative Phase 3

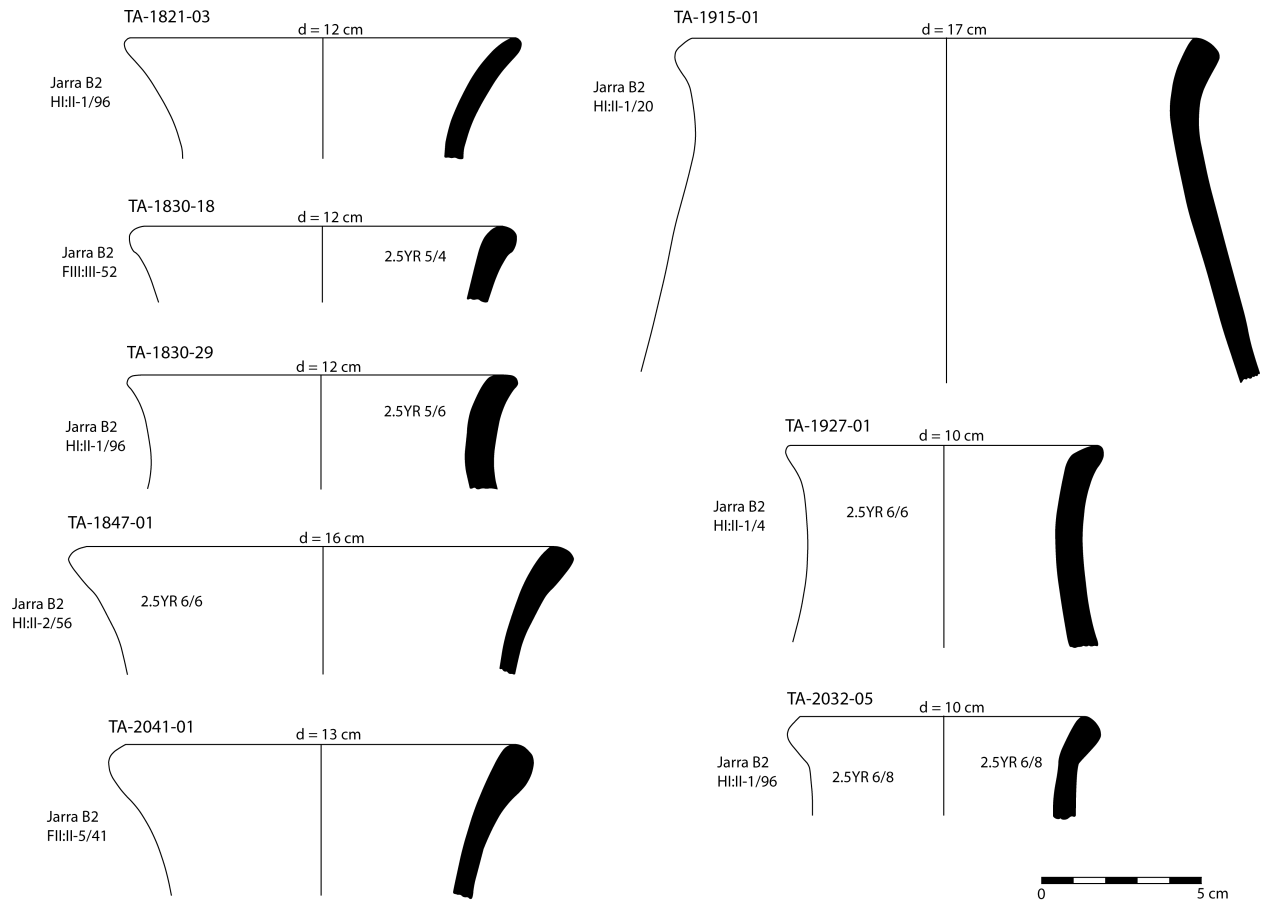


Figure G.32. Selected *Jarras* (Type B), Formative Phase 3

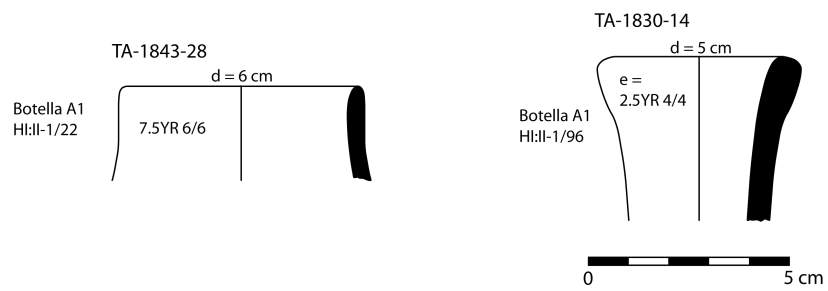


Figure G.33. *Botellas*, Formative Phase 3

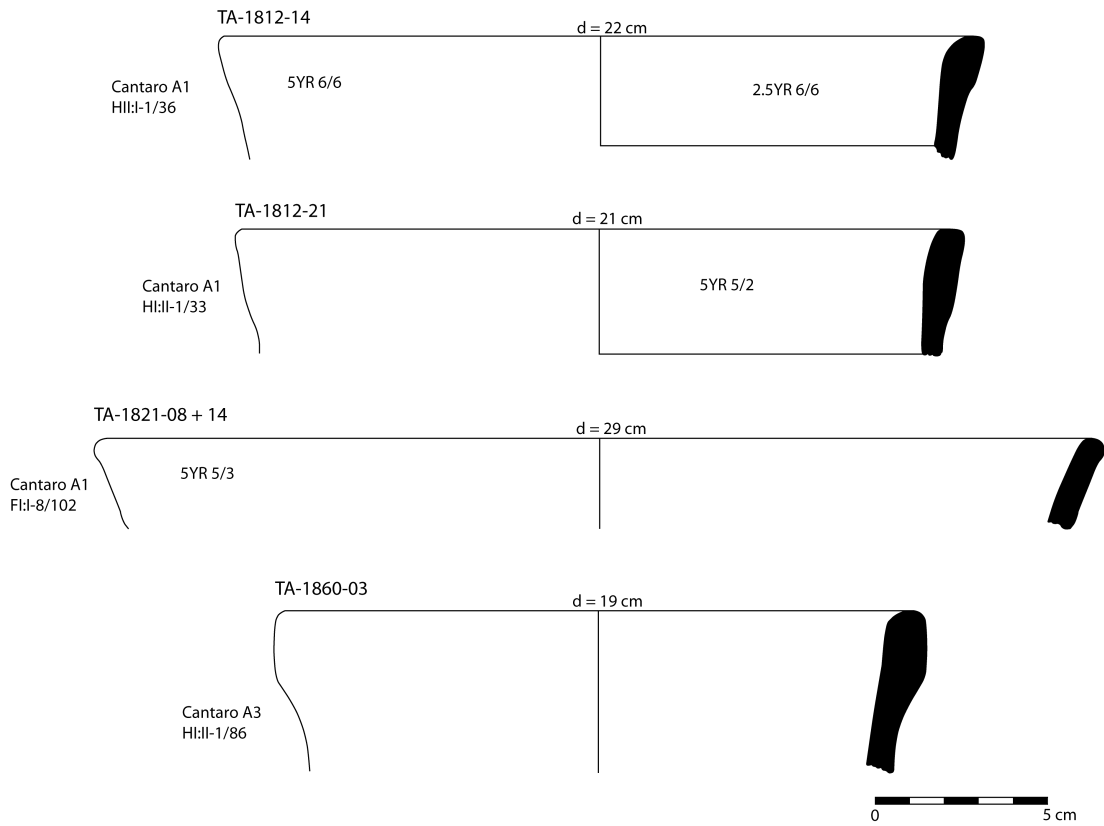


Figure G.34. Selected *Cantaros* (Type A), Formative Phase 3

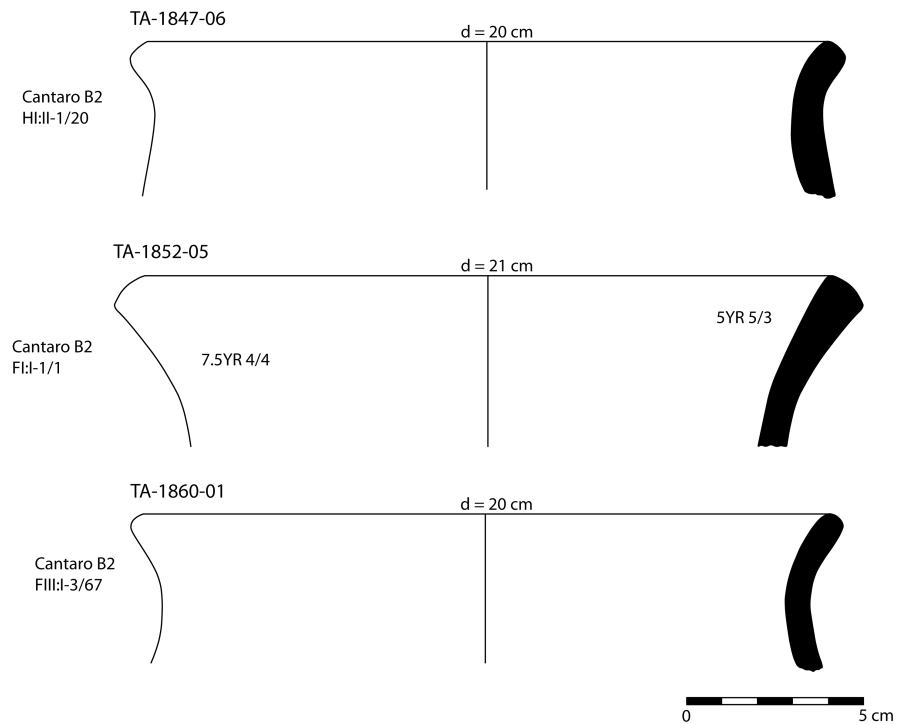


Figure G.35. Selected *Cantaros* (Type B), Formative Phase 3

3.4 Non-Domestic Forms

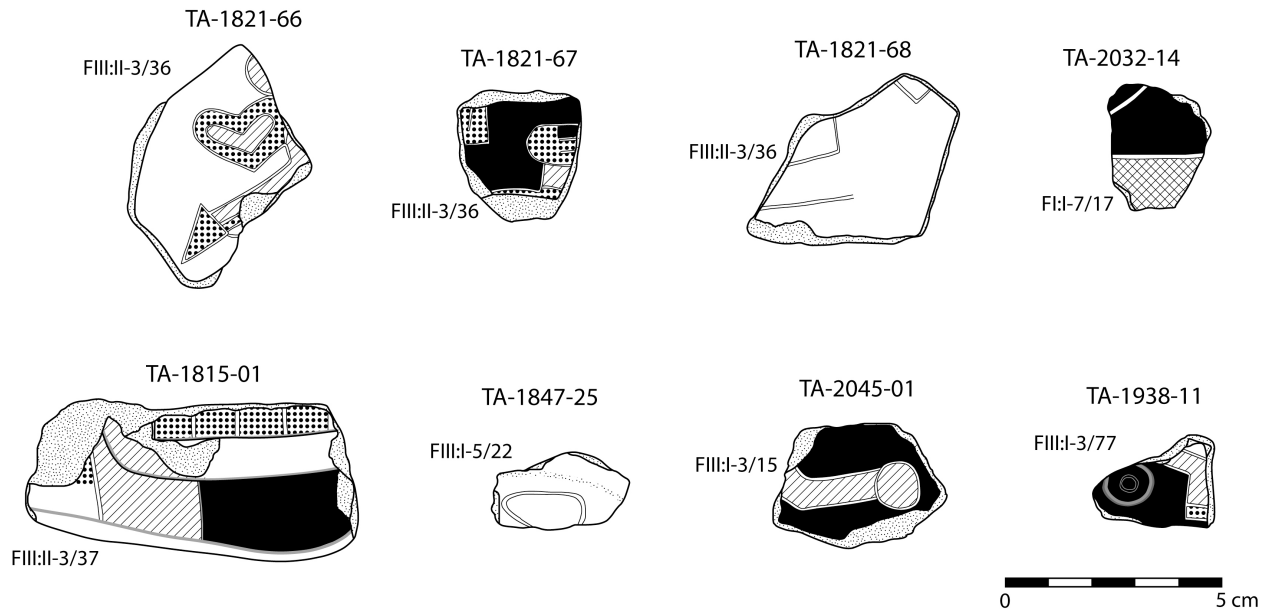


Figure G.36. *Incensario* sherds, Formative Phase 3

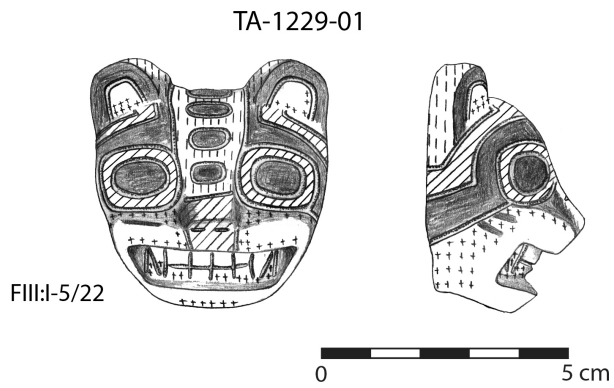


Figure G.37. Feline *incensario* applique (TA-1229-01), Formative Phase 3

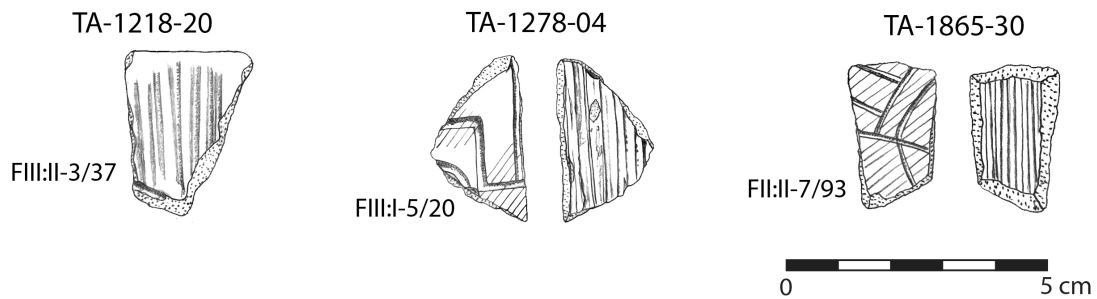


Figure G.38. Selected trumpets, Formative Phase 3

3.5 Decorated Body Sherds

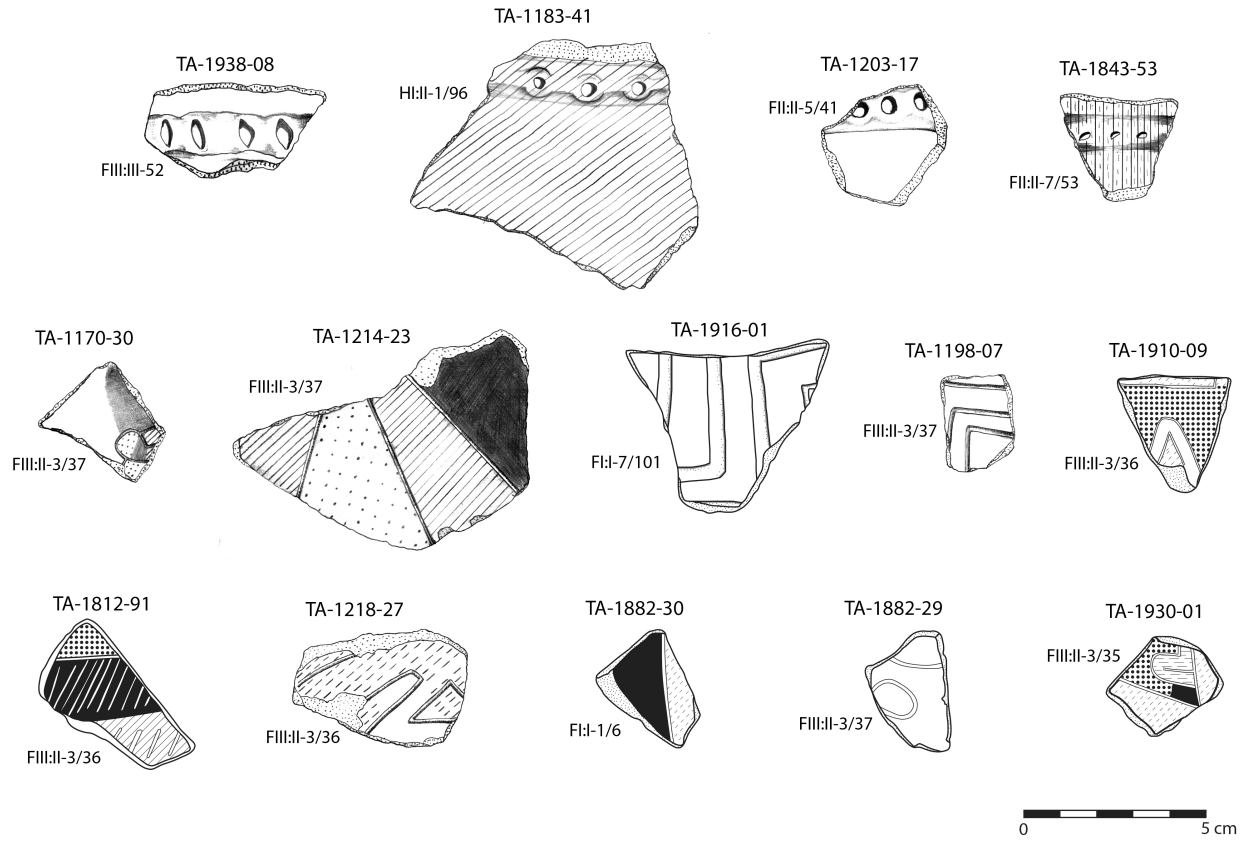


Figure G.39. Selected body sherds with punctate, incised, and polychrome decoration, Formative Phase 3

REFERENCES CITED

- Abbott, Mark B., M. Binford, M. Brenner and K. Kelts
1997 A 3500 ¹⁴C yr High Resolution Record of Water-Level Changes in Lake Titicaca, Bolivia-Peru. *Quaternary Research* 47:169-180.
- Abbott, Mark B., Brent B. Wolfe, Alexander P. Wolfe, Geoffrey O. Seltzer, Ramon Aravena, Brian G. Mark, Pratigya J. Polissar, Donald T. Rodbell, Harry D. Rowe and Mathias Vuille
2003 Holocene paleohydrology and glacial history of the central Andes using multiproxy lake sediment studies. *Paleogeography, Paleoclimatology, Paleoecology* 194:123-138.
- Abrams, Elliot M.
1989 Architecture and Energy: An Evolutionary Perspective. In *Archaeological Method and Theory, Vol. 1*, edited by M. B. Schiffer, pp. 47-87. University of Arizona Press, Tucson.
- Adams, Robert McC
1966 *The Evolution of Urban Society: Early Mesopotamia and Prehispanic Mexico*. Aldine Pub. Co., Chicago.
- 1974 Anthropological Perspectives on Ancient Trade. *Current Anthropology* 15(3):239-258.
- Albarracin-Jordan, Juan
1996a Tiwanaku Settlement System: The Integration of Nested Hierarchies in the Lower Tiwanaku Valley. *Latin American Antiquity* 7(3):183-210.
- 1996b *Tiwanaku: Arqueología Regional y Dinámica Segmentaria*. Editores Plural, La Paz.
- Aldenderfer, Mark S.
1999 Cronología y conexiones: evidencias precerámicas de Asana. In *El Periodo Arcaico en el Perú: Hacia una Definición de los Orígenes*, pp. 3. Boletín de Arqueología PUCP. Pontificia Universidad Católica del Perú, Lima.
- 2002 Late Preceramic Cultural Complexity in the Lake Titicaca Basin. Paper presented at the 67th Annual Meeting of the Society for American Archaeology, Denver.
- Aldenderfer, Mark S., Nathan M. Craig, Robert J. Speakman and Rachel S. Popelka-Filcoff
2008 Four-thousand-year-old gold artifacts from the Lake Titicaca basin, southern Peru. *Proceedings of the National Academy of Sciences* 105(13):5002-5005.

- Algaze, Guillermo
2001 Initial Social Complexity in Southwestern Asia: The Mesopotamian Advantage. *Current Anthropology* 42:199-233.
- Anderson, David G.
1996 Fluctuations Between Simple and Complex Chiefdoms: Cycling in the Late Prehistoric Southeast. In *Political Structure and Change in the Prehistoric Southeastern United States*, edited by J. F. Scarry, pp. 231-252. University Press of Florida, Gainesville.
- Arkush, Elizabeth
2005 Colla Fortified Sites: Warfare and Regional Power in the Late Prehispanic Titicaca Basin, Peru. Ph.D. dissertation, Department of Anthropology, University of California, Los Angeles, Los Angeles.
- Arkush, Elizabeth and Charles Stanish
2005 Interpreting Conflict in the Ancient Andes: Implications for the Archaeology of Warfare. *Current Anthropology* 46(1):3-28.
- Arnold, Dean E.
2000 Does the Standardization of Ceramic Pastes Really Mean Specialization? *Journal of Archaeological Method and Theory* 7(4):333-375.
- Arnold, Denise Y. and Christine Ann Hastorf
2008 *Heads of State: Icons, Power, and Politics in the Ancient and Modern Andes*. Left Coast Press, Walnut Creek.
- Arnold, Jeanne
1993 Labor and the rise of complex hunter-gatherers. *Journal of Anthropological Archaeology* 12:75-119.

1995 Social Inequality, Marginalization, and Economic Process. In *Foundations of Social Inequality*, edited by G. M. Feinman, pp. 87-103. Plenum Press, New York.

1996 Organizational Transformations: Power and Labor among Complex Hunter-Gatherers and Other Intermediate Societies. In *Emergent Complexity: The Evolution of Intermediate Societies*, edited by J. Arnold, pp. 59-73. International Monographs in Prehistory, Ann Arbor.
- Baker, Paul A., Sherilyn C. Fritz, J. Garland and E. Ekdahl
2005 Holocene hydrologic variation at Lake Titicaca Bolivia/Peru, and its relationship to North Atlantic climate variation. *Journal of Quaternary Science* 20(7-8):655-662.
- Baker, Paul A., Catherine A. Rigsby, Geoffrey O. Seltzer, Sherilyn C. Fritz, Robert B. Dunbar, Matthew J. Grove, Pedro M. Tapia, Scott L. Cross, Harry D. Rowe and J. P. Broda

- 2001 The history of South American tropical precipitation for the past 25,000 years. *Science* 291:640-643.
- Bandy, Matthew S.
2001 Population and History in the Ancient Titicaca Basin. Ph.D. dissertation, Department of Anthropology, University of California, Berkeley.
- 2004 Fissioning, Scalar Stress, and Social Evolution in Early Village Societies. *American Anthropologist* 106(2):322-333.
- 2005 Trade and Social Power in the Southern Titicaca Basin Formative. In *The Foundations of Power in the Prehispanic Andes*, edited by K. J. Vaughn, D. E. Ogburn and C. A. Conlee, pp. 91-111. Archaeological Papers of the American Anthropological Association. vol. 14. American Anthropological Association, Washington, D.C.
- Bandy, Matthew S. and Christine A. Hastorf (editors)
2007 *Kala Uyuni: An Early Political Center in the Southern Lake Titicaca Basin*. Archaeological Research Facility, University of California, Berkeley.
- Bard, Edouard
1998 Geochemical and geophysical implications of the radiocarbon calibration. *Geochimica et Cosmochimica Acta* 62(12):2025-2038.
- Bard, Edouard, Bruno Hamelin, Richard G. Fairbanks and Alan Zindler
1990 Calibration of the ¹⁴C timescale over the past 30,000 years using mass spectrometric U-Th ages from Barbados corals. *Nature* 345:405-410.
- Bauer, Brian S. and Charles Stanish
2001 *Ritual and Pilgrimage in the Ancient Andes: The Islands of the Sun and the Moon*. University of Texas Press, Austin.
- Baxter, M. J.
1994 *Exploratory Multivariate Analysis in Archaeology*. Edinburgh University Press, Edinburgh.
- Benedict, Ruth
1948 Anthropology and the Humanities. *American Anthropologist* 50(4):585-593.
- Bennett, Wendell Clark
1934 *Excavations at Tiahuanaco*. Anthropological Papers of the American Museum of Natural History 34, pt. 3. American Museum of Natural History, New York.
- 1936 *Excavations in Bolivia*. Anthropological Papers of the American Museum of Natural History 35, pt. 4. American Museum of Natural History, New York.

- 1948 A Revised Sequence for the South Titicaca Basin. In *A Reappraisal of Peruvian Archaeology*, edited by W. C. Bennett, pp. 90-92. Memoirs of the Society for American Archaeology. vol. 4, I. Rouse, general editor. Society for American Archaeology and the Institute of Andean Research, Menasha.
- 1950 Cultural Unity and Disunity in the Titicaca Basin. *American Antiquity* 16(2):89-98.
- Bermann, Marc
 1994 *Lukurmata: Household Archaeology in Prehispanic Bolivia*. Princeton University Press, Princeton.
- Binford, Lewis R. and Sally R. Binford
 1966 A Preliminary Analysis of Functional Variability in the Mousterian of Levallois Facies. *American Anthropologist* 68(2, Part 2: Recent Studies in Paleoanthropology):238-295.
- Binford, Michael and Alan Kolata
 1996 The Natural and Human Setting. In *Tiwanaku and its Hinterland: Archeology and Paleoecology of an Andean Civilization*, edited by A. Kolata. Smithsonian Institution Press, Washington, D.C.
- Bishop, Ronald L., Veletta Canouts, Suzanne P. De Atley, Alfred Qöyawayma and C. W. Aikins
 1988 The Formation of Ceramic Analytical Groups: Hopi Pottery Production and Exchange, A.C. 1300–1600. *Journal of Field Archaeology* 15(3):317-337.
- Bishop, Ronald L. and Hector Neff
 1989 Compositional Data Analysis in Archaeology. In *Archaeological Chemistry IV*, edited by R. O. Allen, pp. 57-86. Advances in Chemistry. vol. 220. American Chemical Society.
- Blackman, James M., Gil J. Stein and Pamela Vandiver
 1993 The Standardization Hypothesis and Ceramic Mass Production: Technological, Compositional, and Metric Indexes of Craft Specialization at Tell Leilan, Syria. *American Antiquity* 58(1):60-80.
- Blackwell, Paul G., Caitlin E Buck and P.J. Reimer
 2006 Important features of the new radiocarbon calibration curves. *Quaternary Science Reviews* 25:408-413.
- Blanton, R., Gary M. Feinman, Stephen A. Kowalewski and P. Peregrine
 1996 A dual-processual theory of the evolution of Mesoamerican Civilization. *Current Anthropology* 37(1):1-14.
- Blitz, John H.

- 1993 Big Pots for Big Shots: Feasting and Storage in a Mississippian Community. *American Antiquity* 58(1):80-96.
- Blomster, Jeffrey P. and Michael D. Glascock
2011 Obsidian procurement in formative Oaxaca, Mexico: Diachronic changes in political economy and interregional interaction. *Journal of Field Archaeology* 36(1):21-41.
- Boas, Franz
1987 [1940] The Limitations of the Comparative Method of Anthropology. In *Race, Language, and Culture*, pp. 270-280. The Free Press, New York.
- Boulangé, Bruno and E. Aquize Jean
1981 Morphologie, hydrographie et climatologie du Lac Titicaca et de son bassin versant. *Revue d'Hydrobiologie Tropicale* 14:269-287.
- Boyd, Robert and Peter J. Richerson
1985 *Culture and the Evolutionary Process*. University of Chicago Press, Chicago.

2005 *The Origin and Evolution of Cultures*. Evolution and cognition. Oxford University Press, New York.
- Boyd, Robert, Peter J. Richerson and Joseph Henrich
2005 Cultural Evolution of Human Cooperation. In *The Origin and Evolution of Cultures*, pp. 251-281. Oxford University Press, New York.
- Bradley, R. S.
1985 *Quaternary Paleoclimatology*. Chapman & Hall, London.
- Brantingham, P. Jeffrey, Kristopher W. Kerry, Andrei I. Krivoshapkin and Yaroslav V. Kuzmin.
2004 Time-Space Dynamics in the Early Upper Paleolithic of Northeast Asia. In *Entering America: Northeast Asia and Beringia Before the Last Glacial Maximum*, edited by D. B. Madsen, pp. 255-283. University of Utah Press, Salt Lake City.
- Braum, Misty, Mark Louis Golitko, John W. Janusek, Abigail Levine, Charles Stanish and Patrick Ryan Williams
2010 Basalt Sources in the Andean Altiplano, Poster presented at the 75th Annual Meeting of the Society for American Archaeology, St. Louis.
- Browman, David L.
1981 New Light on Andean Tiwanaku. *American Scientist* 69(4):408-419.
- Browne, David M., Helaine Silverman and Rubén García
1993 A Cache of 48 Nasca Trophy Heads from Cerro Carapo, Peru. *Latin American Antiquity* 4(3):274-294.

- Brumfiel, Elizabeth M. and Timothy K. Earle (editors)
1987 *Specialization, Exchange, and Complex Societies*. Cambridge University Press, Cambridge.
- Burger, R., F. Asaro, F. Stross and G. Salas
1998 The Chivay Obsidian Source and the Geological Origin of Titicaca Basin Type Obsidian Artifacts. *Andean Past* 5:203-224.
- Burger, Richard, Karen L. Mohr Chávez and Sergio Jorge Chávez
2000 Through the Glass Darkly: Prehispanic Obsidian Procurement and Exchange in Southern Peru and Northern Bolivia. *Journal of World Prehistory* 14(3):267-362.
- Burger, Richard L.
1992 *Chavin and the Origins of Andean civilization*. Thames and Hudson, London.
- Carneiro, Robert L.
1970 A Theory of the Origin of the State. *Science* 169(3947):733-738.

1981 The Chiefdom: Precursor of the State. In *The Transition to Statehood in the New World*, edited by G. Jones and R. Kautz, pp. 37-79. Cambridge University Press, Cambridge.

1988 The Circumscription Theory: Challenge and Response. *American Behavioral Scientist* 31(4):497-511.
- Cavalli-Sforza, L. L. and Marcus W. Feldman
1981 *Cultural Transmission and Evolution: A Quantitative Approach*. Monographs in population biology. Princeton University Press, Princeton, N.J.
- Chávez, Cecilia
2007 *Excavaciones Arqueológicas en el Sitio de Taraco-Puno: Temporada 2006*. Instituto Nacional de Cultura, Lima, Peru.

2008a Análisis de la Cerámica del Sector Medio y Bajo de la Sub-Cuenca del Río Huancané (Puno-Peru). Cotsen Institute of Archaeology, UCLA.

2008b *Excavaciones Arqueológicas en el Sitio de Taraco-Puno: Temporada 2007*. Instituto Nacional de Cultura, Lima, Peru.
- Chávez, Karen L. Mohr
1977 Marcavalle: The Ceramics from an Early Horizon Site in the Valley of Cusco, Peru. Ph.D. dissertation, Department of Anthropology, University of Pennsylvania.

1985 Early Tiahuanaco-Related Ceremonial Burners from Cuzco, Peru. *Dialogo Andino* 4:137-178.

- 1988 The Significance of Chiripa in Lake Titicaca Basin Developments. *Expedition* 30(3):17-26.
- Chávez, Sergio
 1992 The Conventionalized Rules in Pucara Pottery Technology and Iconography: Implications for Socio-Political Development in the Northern Lake Titicaca Basin, Department of Anthropology, Michigan State University.
- Chávez, Sergio and Karen Mohr Chávez
 1970 Newly Discovered Monoliths from the Highlands of Puno, Peru. *Expedition* 12(4):25-39.
- 1975 A Carved Stone Stela from Taraco, Puno, Peru, and the Definition of an Early Style of Stone Sculpture from the Altiplano of Peru and Bolivia. *Ñawpa Pacha* 13:45-83.
- Chávez V., A. and E. Gutierrez S.
 1996 Mapa Geológico del Cuadrángulo de Putina. República del Perú, Ministerio de Energía y Minas, Instituto Geológico Minero y Metalúrgico, Lima.
- Cieza de León, Pedro
 1959 [1553] *The Incas of Pedro de Cieza de León*. Edited by V. W. Von Hagen. University of Oklahoma Press, Norman.
- Cipolla, Lisa M.
 2005 Preceramic Period Settlement Patterns in the Huancane-Putina River Valley, Northern Titicaca Basin, Peru. In *Advances in Titicaca Basin Archaeology*, edited by M. S. Aldenderfer, pp. 55-63. vol. 1. Cotsen Institute of Archaeology at UCLA, Los Angeles.
- Clark, John E. and Michael Blake
 1994 The Power of prestige: competitive generosity and the emergence of ranked societies in lowland Mesoamerica. In *Factional Competition and Political Development in the New World*, edited by E. M. Brumfiel and J. W. Fox, pp. 17-30. Cambridge University Press, Cambridge.
- Cohen, Amanda B.
 2004 The Ritualization of Early Ceremonial Architecture. Paper presented at the 69th Annual Meeting of the Society for American Archaeology, Montreal.
- 2008 Assembling the Yaya-Mama Religious Tradition. Paper presented at the 73rd Annual Meeting of the Society for American Archaeology, Vancouver.
- 2010 Ritual and Architecture in the Titicaca Basin: The Development of the Sunken Court Complex in the Formative Period. Ph.D. dissertation, Department of Anthropology, University of California, Los Angeles.

- Cohen, Amanda and Andrew Roddick
 2007 Excavations in the AC (Achachi Coa Kkollu) Sector. In *Kala Uyuni: An Early Political Center in the Southern Lake Titicaca Basin*, edited by M. S. Bandy and C. A. Hastorf. Archaeological Reserach Facility, University of California, Berkeley.
- Conklin, William
 1983 Pucara and Tihuanaco Tapestry: Time and Style in a Sierra Weaving Tradition. *Ñawpa Pacha* 21:1-44.
- Cordy-Collins, Alana
 1976 An Iconographic Study of Chavín Textiles from the South Coast of Peru: The Discovery of a Pre-Columbian Catechism. Ph.D. dissertation, Interdepartamental Program in Archaeology, University of California, Los Angeles.
- Costin, Cathy L.
 1991 Craft Specialization: Issues in Defining, Documenting and Explaining the Organization of Production. In *Archaeological Method and Theory*, edited by M. B. Schiffer, pp. 1-56. vol. 3. University of Arizona Press, Tucson.
- Costin, Cathy L. and Melissa B. Hagstrum
 1995 Standardization, Labor Investment, Skill, and the Organization of Ceramic Production in Late Prehispanic Highland Peru. *American Antiquity* 60(4):619-639.
- Craig, Nathan, Mark Aldenderfer, Paul Baker and Catherine Rigsby
 2010 Terminal Archaic Settlement Pattern and Land Cover Change in the Rio Ilave, Southwestern Lake Titicaca Basin, Perú. In *The Archaeology of Anthropogenic Environments*, edited by R. Dean, pp. 35-53. Southern Illinois University, Carbondale.
- Craig, Nathan M.
 2005 The Formation of Early Settled Villages and the Emergence of Leadership: A Test of Three Theoretical Models in the Rio Ilave, Lake Titicaca Basin, Southern Peru. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.
- Craig, Nathan M. and Mark S. Aldenderfer
 2002 Domestic Architecture from the Late Archaic South-Central Andean Site of Jiskairumoko. Paper presented at the 67th Annual Meeting of the Society for American Archaeology, Denver.
- Craig, Nathan M., Robert J. Speakman, Rachel S. Popelka-Filcoff, Michael D. Glascock, J. David Robertson, M. Steven Shackley and Mark S. Aldenderfer
 2007 Comparison of XRF and PXRF for analysis of archaeological obsidian from southern Perú. *Journal of Archaeological Science* 34:2012-2024.
- Craig, Nathan, Robert J. Speakman, Rachel S. Popelka-Filcoff, Mark Aldenderfer, Luis Flores Blanco, Margaret Brown Vega, Michael D. Glascock and Charles Stanish

- 2010 Macusani obsidian from southern Peru: a characterization of its elemental composition with a demonstration of its ancient use. *Journal of Archaeological Science* 37(3):569-576.
- Cutright, Robyn E.
2009 Between the Kitchen and the State: Domestic Practice and Chimú Expansion in the Jequetepeque Valley, Peru. Ph.D. dissertation, Department of Anthropology, University of Pittsburgh.
- D'Agostino, Karin, Geoffrey Seltzer, Paul Baker, Sherilyn Fritz and Robert Dunbar
2002 Late-Quaternary lowstands of Lake Titicaca: evidence from high-resolution seismic data. *Paleogeography, Paleoclimatology, Paleoecology* 179:97-111.
- de la Cruz B., Natalio
1999 Mapa Geológico del Cuadrángulo de Azángaro. República del Perú, Ministerio de Energía y Minas, Instituto Geológico Minero y Metalúrgico, Lima.
- de la Vega, Edmundo
2005 *Excavaciones Arqueológicas en el Sitio de Taraco-Puno*. Instituto Nacional de Cultura, Lima, Peru.
- Dean, Jeffrey S.
1978 Independent Dating in Archaeological Analysis. *Advances in Archaeological Method and Theory* 1:223-255.
- DeBoer, Warren R. and Donald W. Lathrap
1979 The making and breaking of Shipibo-Conibo ceramics. In *Ethnoarchaeology: Implications of Ethnography for Archaeology*, edited by C. Kramer, pp. 102-108. Columbia University Press, New York.
- DeMarrais, Elizabeth, Luis Jamie Castillo and Timothy K. Earle
1996 Ideology, materialization and power strategies. *Current Anthropology* 37:15-31.
- deMenocal, Peter B.
2001 Cultural Responses to Climate Change during the Late Holocene. *Science* 292(5517):667-673.
- Donnan, Christopher B.
1992 *Ceramics of Ancient Peru*. Fowler Museum of Cultural History, Los Angeles.
- Donnan, Christopher B. and Donna McClelland
1999 *Moche Fineline Painting: Its Evolution and Its Artists*. Fowler Museum of Cultural History, Los Angeles.
- Drennan, R.

- 1991 Prehispanic Chiefdom Trajectories in Mesoamerica, Central America, and Northern South America. In *Chiefdoms: Power, Economy and Ideology*, edited by T. K. Earle, pp. 263-287. Cambridge University Press, Cambridge.
- Druc, Isabelle C., Richard L. Burger, Regina Zamojska and Pierre Magny
2001 Ancón and Garagay Ceramic Production at the Time of Chavín de Huántar. *Journal of Archaeological Science* 28:29-43.
- Durham, William H.
1991 *Coevolution: Genes, Culture, and Human Diversity*. Stanford University Press, Stanford.
- Durkheim, Émile
1995 *The Elementary Forms of Religious Life*. Translated by K. E. Fields. Free Press, New York.
- Dussubieux, Laure, Mark Golitko, P. Ryan Williams and R. J. Speakman
2007 LA-ICP-MS Analysis Applied to the Characterization of Peruvian Wari Ceramics. In *Archaeological Chemistry: Analytical Technique and Archaeological Interpretation*, edited by M. D. Glascock, R. J. Speakman and R. S. Popelka-Filcoff, pp. 349-363. American Chemical Society, Washington, D.C.
- Earle, Timothy K.
1977 A reappraisal of redistribution: complex Hawaiian chiefdoms. In *Exchange Systems in Prehistory*, edited by T. K. Earle and J. E. Ericson, pp. 213-229. Academic Press, New York.
- 1987a Chiefdoms in archaeological and ethnohistorical perspective. *Annual Review of Anthropology* 16:279-308.
- 1987b Specialization and the Production of Wealth: Hawaiian Chiefdoms and the Inka Empire. In *Specialization, Exchange and Complex Societies*, edited by T. K. Earle. Cambridge University Press, Cambridge.
- 1989 The Evolution of Chiefdoms. *Current Anthropology* 30(1):84-88.
- 1990 Style and Iconography as legitimation in complex chiefdoms. In *Uses of Style and Archaeology*, edited by M. Conkey and C. Hastorf, pp. 73-81. Cambridge University Press, Cambridge.
- 1991a *Chiefdoms: Power, Economy, and Ideology*. School of American Research advanced seminar series. Cambridge University Press, Cambridge.
- 1991b Property rights and the evolution of chiefdoms. In *Chiefdoms: Power, Economy and Ideology*, edited by T. K. Earle, pp. 71-99. Cambridge University Press, Cambridge.

- 1997 *How Chiefs Come to Power: The Political Economy in Prehistory*. Stanford University Press, Stanford.
- Elliott, Shane, Michael Knowles and Iouri Kalinitchenko
2004 A New Direction in ICP-MS. *Spectroscopy* 19(1):30-38.
- Ellison, R. A. and N. S. de la Cruz B.
1987 Mapa Geológico del Cuadrángulo de Huancané. República del Perú, Ministerio de Energía y Minas, Instituto Geológico Minero y Metalúrgico, Lima.
- Erickson, Clark
1985 Applications of Prehistoric Andean Technology: Experiments in Raised Field Agriculture, Huatta, Lake Titicaca, 1981-1982. In *Prehistoric Intensive Agriculture in the Tropics*, edited by I. Farrington, pp. 209-232. BAR International Series. vol. 232(i). BAR, Oxford.
- 1988 An Archaeological Investigation of Raised Field Agriculture in the Lake Titicaca Basin of Peru. Ph.D. dissertation, Department of Anthropology, University of Illinois at Champaign-Urbana.
- 1993 The Social Organization of Prehispanic Raised Field Agriculture in the Lake Titicaca Basin. In *Prehispanic Water Management Systems, Supplement no. 7*, edited by B. Isaac. Research in Economic Anthropology. JAI Press.
- Farmer, Paul
1992 *AIDS and Accusation: Haiti and the Geography of Blame*. University of California Press, Berkeley.
- Faure, Gunter and Teresa M. Mensing
2005 *Isotopes: Principles and Applications*. 3rd ed. Wiley, Hoboken.
- Feinman, Gary M. and Joyce Marcus (editors)
1998 *Archaic States*. School of American Research Press, Santa Fe.
- Feinman, Gary M. and Jill Neitzel
1984 Too Many Types: An Overview of Sedentary Pre-State Societies in the Americas. In *Advances in Archaeological Method and Theory*, edited by M. B. Schiffer, pp. 39-102. vol. 7. Academic Press, Orlando.
- Field, Julie S., Thegn N. Ladefoged and Patrick V. Kirch
2011 Household expansion linked to agricultural intensification during emergence of Hawaiian archaic states. *Proceedings of the National Academy of Sciences* 108(18):7327-7332.
- Firth, Raymond William

- 1957 *We, the Tikopia: A Sociological Study of Kinship in Primitive Polynesia*. Allen & Unwin, London.
- Flannery, Kent V.
 1972 The Cultural Evolution of Civilizations. *Annual Review of Ecology and Systematics* 3:399-425.
 1976 *The Early Mesoamerican Village*. Academic Press, New York.
- Flannery, Kent V. and Joyce Marcus
 2003 The origin of war: New ¹⁴C dates from ancient Mexico. *Proceedings of the National Academy of Sciences* 100(20):11801-11805.
- Franquemont, Edward M.
 1986 The Ancient Pottery from Pucara, Peru. *Ñawpa Pacha* 24:1-30.
- Frye, Kirk Lawrence and Lee Steadman
 2001 Incatunahuri: a case for early socio-political complexity in the Titicaca Basin. Paper presented at the 66th Annual Meeting of the Society for American Archaeology, New Orleans.
- Galtung, Johan
 1969 Violence, Peace, and Peace Research. *Journal of Peace Research* 6(3):167-191.
- Glascock, Michael D., Hector Neff and Kevin J. Vaughn
 2004 Instrumental Neutron Activation Analysis and Multivariate Statistics for Pottery Provenance. *Hyperfine Interactions* 154:95-105.
- Glascock, Michael D., Robert J. Speakman and Richard Burger, L.
 2007 Sources of archaeological obsidian in Peru: Descriptions and geochemistry. In *Archaeological Chemistry: Analytical Techniques and Archaeological Interpretation*, edited by M. D. Glascock, R. J. Speakman and R. S. Popelka-Filcoff, pp. 522-552. American Chemical Society, Washington, D.C.
- Goldstein, Paul S.
 2000 Exotic Goods and Everyday Chiefs: Long-Distance Exchange and Indigenous Sociopolitical Development in the South Central Andes. *Latin American Antiquity* 11(4):335-361.
 2005 *Andean Diaspora: The Tiwanaku Colonies and the Origins of South American Empire*. New World diasporas. University Press of Florida, Gainesville.
- Golitko, Mark Louis
 2010 Warfare and Alliance Building during the Belgian Early Neolithic, Late Sixth Millennium BC. Ph.D. dissertation, Department of Anthropology, University of Illinois at Chicago.

- 2011 Chapter 13: Provenience Investigations of Ceramic and Obsidian Samples Using Laser Ablation Inductively Coupled Plasma Mass Spectrometry and Portable X-Ray Fluorescence. *Fieldiana Anthropology*:251-287.
- Gratuze, B., M. Blet-Lemarquand and J. N. Barrandon
2001 Mass spectrometry with laser sampling: A new tool to characterize archaeological materials. *Journal of Radioanalytical and Nuclear Chemistry* 247(3):645-656.
- Griffin, Arthur F. and Charles Stanish
2007 An Agent-based Model of Prehistoric Settlement Patterns and Political Consolidation in the Lake Titicaca Basin of Peru and Bolivia. *Structure and Dynamics: eJournal of Anthropological and Related Sciences* 2(2):1-47.
- Grosjean, M., R. Cartajena, M. A. Geyh and L. Nuñez
2003 From proxy data to paleoclimate interpretation: the mid-Holocene paradox of the Atacama desert, northern Chile. *Paleogeography, Paleoclimatology, Paleoecology* 194:247-258.
- Grove, Matthew J., Paul A. Baker, Scott L. Cross, Catherine A. Rigsby and Geoffrey O. Seltzer
2003 Application of strontium isotopes to understanding the hydrology and paleohydrology of the Altiplano, Bolivia-Peru. *Paleogeography, Paleoclimatology, Paleoecology* 194:281-297.
- Hagstrum, Melissa B.
1985 Measuring Prehistoric Ceramic Craft Specialization: A Test Cast in the American Southwest. *Journal of Field Archaeology* 12(1):65-76.
- Haines, Helen R., Gary M. Feinman and Linda M. Nicholas
2004 Household Economic Specialization And Social Differentiation: The stone-tool assemblage at El Palmillo, Oaxaca. *Ancient Mesoamerica* 15(02):251-266.
- Harbottle, G.
1976 Activation Analysis in Archaeology. In *Radiochemistry*, edited by G. W. A. Newton, pp. 33-72. vol. 3. The Chemical Society, London.
- Hastorf, Christine A.
1999 *Early Settlement at Chiripa, Bolivia*. University of California Press, Berkeley.

2003 Community with the ancestors: ceremonies and social memory in the Middle Formative at Chiripa, Bolivia. *Journal of Anthropological Archaeology* 22(4):305-332.

2005 The Upper (Middle and Late) Formative in the Titicaca Region. In *Advances in Titicaca Basin Archaeology I*, edited by M. S. Aldenderfer, pp. 65-94. Cotsen Institute of Archaeology at UCLA, Los Angeles.

- Hayashida, Frances M.
2008 Ancient beer and modern brewers: Ethnoarchaeological observations of chicha production in two regions of the North Coast of Peru. *Journal of Anthropological Archaeology* 27(2):161-174.
- Hayden, Brian
1990 Nimrods, piscators, pluckers, and planters: the emergence of food production. *Journal of Anthropological Archaeology* 9:31-69.

1995 Pathways to Power: Principles for Creating Socioeconomic Inequalities. In *Foundations of Social Inequality*, edited by G. M. Feinman, pp. 15-86. Plenum Press, New York.

1998 Practical and Prestige Technologies: The Evolution of Material Systems. *Journal of Archaeological Method and Theory* 5(1):1-55.
- Hegmon, Michelle
1992 Archaeological Research on Style. *Annual Review of Anthropology* 21:517-536.
- Helms, Mary W.
1993 *Craft and the Kingly Ideal: Art, Trade, and Power*. University of Texas Press, Austin.
- Henrich, Joseph and Robert Boyd
1998 The Evolution of Conformist Transmission and the Emergence of Between-Group Differences. *Evolution and Human Behavior* 19:215-241.
- Henrich, Joseph, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis and Richard McElreath
2001 In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies. *The American Economic Review* 91(2):73-78.
- Henrich, Joseph and F.J. Gil-White
2001 The Evolution of Prestige: Freely Conferred Deference as a Mechanism for Enhancing the Benefits of Cultural Transmission. *Evolution and Human Behavior* 22:165-196.
- Henrich, Joseph and Natalie Smith
2004 Comparative experimental evidence from Machiguenga, Mapuche, Huinca, and American Populations. In *Foundations of Human Sociality*, edited by J. Henrich, R. Boyd, S. Bowles, C. Camerer, E. Fehr and H. Gintis, pp. 125-167. Oxford University Press, Oxford.
- Hirth, Kenneth G.
1996 Political Economy and Archaeology: Perspectives on Exchange and Production. *Journal of Archaeological Research* 4(3):203-239.

- 2009 Craft Production, Household Diversification, and Domestic Economy in Prehispanic Mesoamerica. *Archeological Papers of the American Anthropological Association* 19(1):13-32.
- Ikehara, Hugo
 2010 Social organization, technology of production, and the function of utilitarian ceramics for feasting during the Middle and Late Formative Periods in the Central Andes. In *Comparative Perspectives on the Archaeology of Coastal South America*, edited by R. E. Cutright, E. López-Hurtado and A. Martin, pp. 45-62. University of Pittsburgh, Pittsburgh, PA.
- Isbell, William Harris
 1997 *Mummies and Mortuary Monuments: A Postprocessual Prehistory of Central Andean Social Organization*. University of Texas Press, Austin.
- Janusek, John Wayne
 1994 State and Local Power in a Prehispanic Andean Polity: Changing Patterns of Urban Residence in Tiwanaku and Lukurmata. Ph.D. dissertation, Department of Anthropology, University of Chicago, Chicago.
- 2004 Tiwanaku and Its Precursors: Recent Research and Emerging Perspectives. *Journal of Archaeological Research* 12(2):121-183.
- 2008 *Ancient Tiwanaku*. Cambridge University Press, New York.
- Janusek, John Wayne and Victor Plaza Martinez
 2007 *Khonkho e Iruhito: Tercer Informe Preliminar del Proyecto Jach'a Machaca*. Report submitted to the Unidad Nacional de Arqueología, La Paz, Bolivia.
- Jennings, Justin and Michael D. Glascock
 2002 Description and Methods of Exploitation of the Alca Obsidian Source, Peru. *Latin American Antiquity* 13(1):107-118.
- Johnson, Allen W. and Timothy K. Earle
 2000 *The Evolution of Human Societies: From Foraging Group to Agrarian State*. Stanford University Press, Stanford.
- Johnson, Gregory A
 1975 Locational Analysis and the Investigation of Uruk Local Exchange Systems. In *Ancient Civilization and Trade*, edited by J. A. Sabloff and C. C. Lamberg-Karlovsky, pp. 285-339. University of New Mexico Press, Albuquerque.
- Johnson, Gregory Alan

- 1982 Organizational structure and scalar stress. In *Theory and Explanation in Archaeology*, edited by C. Renfrew, M. Rowlands, and B. Segraves-Whallon, pp. 389-421. Academic Press, New York.
- Junker, Laura Lee
1993 Craft Goods Specialization and Prestige Goods Exchange in Philippine Chiefdoms of the Fifteenth and Sixteenth Centuries. *Asian Perspectives* 32(1):1-35.
- 1999 *Raiding, Trading, and Feasting: The Political Economy of Philippine Chiefdoms*. University of Hawai'i Press, Honolulu.
- 2002 Economic specialization and inter-ethnic trade between foragers and farmers in the Prehispanic Philippines. In *Forager-Traders in South and Southeast Asia: Long-Term Histories*, edited by K. D. Morrison and L. L. Junker, pp. 203-241. Cambridge University Press, Cambridge.
- Junker, Laura Lee and Lisa Niziolek
2010 Food preparation and feasting in the household and political economy of pre-Hispanic Philippine chiefdoms. In *Inside Ancient Kitchens*, edited by E. A. Klarich, pp. 17-53. University Press of Colorado, Boulder.
- Kennett, Douglas J. and James P. Kennett
2000 Competitive and Cooperative Responses to Climatic Instability in Coastal Southern California. *American Antiquity* 65(2):379-395.
- Kidder, Alfred, II
1943 *Some Early Sites in the Northern Lake Titicaca Basin*. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University 27, No. 1, Cambridge.
- 1948 The Position of Pucara in Titicaca Basin Archaeology. In *A Reappraisal of Peruvian Archaeology*, edited by W. C. Bennett, pp. 87-89. Society for American Archaeology and the Institute for Andean Research, Menasha.
- 1956 Digging in the Titicaca Basin. *University Museum Bulletin* 20(3):16-29.
- Klarich, Elizabeth Ana
2005 From the Monumental to the Mundane: Defining Early Leadership Strategies at Late Formative Pukara, Peru. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.
- Klarich, Elizabeth Ana and Honorato Ttacca
2006 3000 Years of Pottery Production: Insights and Cautionary Tales from the Lake Titicaca Basin, Peru. Paper presented at the 71st Annual Meeting of the Society for American Archaeology, San Juan.

- Klinck, B. A. and Oscar Palacios M.
1984 Mapa Geológico del Cuadrángulo de Juliaca. República del Perú, Ministerio de Energía y Minas, Instituto Geológico Minero y Metalúrgico, Lima.
- Knudson, Kelly J., Sloan R. Williams, Rebecca Osborn, Kathleen Forgey and Patrick Ryan Williams
2009 The geographic origins of Nasca trophy heads using strontium, oxygen, and carbon isotope data. *Journal of Anthropological Archaeology* 28(2):244-257.
- Kobayashi, Masashi
1994 Use-alteration analysis of Kalinga pottery: interior carbon deposits of cooking pots. In *Kalinga Ethnoarcheology: Expanding Archaeological Method and Theory*, edited by W. A. Longacre and J. M. Skibo, pp. 127-168. Smithsonian Institution Press, Washington, D.C.
- Kolata, Alan L.
1991 The technology and organization of agricultural production in the Tiwanaku State *Latin American Antiquity* 2(2):99-125.
- Kowalewski, Stephen A.
1990 The Evolution of Complexity in the Valley of Oaxaca. *Annual Review of Anthropology* 19:39-58.
- Laland, Kevin N. and Gillian Brown
2002 *Sense and Nonsense: Evolutionary Perspectives on Human Behaviour*. Oxford University Press, Oxford.
- Larson, Lewis H. Jr.
1972 Functional Consideration of Warfare in the Southeast During the Mississippian Period. *American Antiquity* 37:383-392.
- LeBlanc, Steven A.
1999 *Prehistoric Warfare in the American Southwest*. University of Utah Press, Salt Lake City.
- LeBlanc, Steven A. and Katherine E. Register
2003 *Constant Battles: the Myth of the Peaceful, Noble Savage*. St. Martin's Press, New York.
- Lepofsky, Dana, Ken Lertzman, Douglas Hallett and Rolf Mathewes
2005 Climate Change and Culture Change on the Southern Coast of British Columbia 2400-1200 Cal. B.P.: An Hypothesis. *American Antiquity* 70(2):267-293.
- Levine, Abigail, Cecilia Chávez, Amanda Cohen, Aimée Plourde and Charles Stanish

- In Press El Surgimiento de la Complejidad Social en la Cuenca Norte del Titicaca. In *Arqueología de la Cuenca del Titicaca*, edited by L. Flores Blanco and H. Tantaleán. Universidad de San Marcos, Lima.
- Lumbreras, Luis G. and Hernan Amat
 1968 Secuencia Arqueologica del Altiplano Occidental del Titicaca. *Proceedings of the XXXVII Congreso Internacional de Americanistas, Actas y Memorias* 2:75-106. Buenos Aires.
- Lumbreras, Luis Guillermo
 1989 *Chavín de Huántar en el Nacimiento de la Civilización Andina*. Ediciones INDEA, Instituto Andino de Estudios Arqueológicos, Lima, Perú.
- Malinowski, Bronislaw
 1920 Kula: the Circulating Exchange of Valuables in the Archipelagoes of Eastern New Guinea. *Man* 20:97-105.
- 1945 *The Dynamics of Culture Change*. Yale University Press, New Haven.
- 1961 [1922] *Argonauts of the Western Pacific: An Account of Native Enterprise and Adventure in the Archipelagoes of Melanesian New Guinea*. E.P. Dutton and Co.
- Marcus, Joyce
 1973 Territorial Organization of the Lowland Classic Maya. *Science* 180(4089):911-916.
- 1983 Lowland Maya Archaeology at the Crossroads. *American Antiquity* 48(3):454-488.
- 1998 The Peaks and Valleys of Ancient States In *Archaic States*, edited by G. M. Feinman and J. Marcus, pp. 59-94. School of American Research Press, Santa Fe.
- 2008 The Archaeological Evidence for Social Evolution. *Annual Review of Anthropology* 37:251-266.
- Marcus, Joyce and Kent V. Flannery
 1996 *Zapotec Civilization: How Urban Society Evolved in Mexico's Oaxaca Valley*. Thames and Hudson, New York.
- Masuda, Shozo, Izumi Shimada and Craig Morris (editors)
 1985 *Andean Ecology and Civilization*. University of Tokyo Press, Tokyo.
- Mathew, Sarah and Robert Boyd
 2011 Punishment sustains large-scale cooperation in prestate warfare. *Proceedings of the National Academy of Sciences* 108(28):11375-11380.

- Mauss, Marcel
1990 [1950] *The Gift: The Form and Reason for Exchange in Archaic Societies*. W.W. Norton, New York.
- Maynard Smith, John and Eors Szathmary
1995 *The Major Transitions in Evolution*. Oxford University Press, Oxford.
- McClelland, Donna, Donald McClelland and Christopher B. Donnan
2007 *Moche Fineline Painting from San José de Moro*. Cotsen Institute of Archaeology at UCLA, Los Angeles.
- Mélice, J. L. and P. Roucou
1998 Decadal time scale variability recorded in the Quelccaya summit ice core $\delta^{18}\text{O}$ isotopic ratio series and its relation with the sea surface temperature. *Climate Dynamics* 14:117-132.
- Melson, Megan
2010 Trade and Exchange in the Neolithic Near East: Implications of Obsidian Remains from *Ais Yiorkis*, Cyprus. Ph.D. dissertation, Department of Anthropology, University of Nevada, Las Vegas.
- Michczynski, Adam
2004 Influence of ^{14}C Concentration Changes in the Past on Statistical Influence of Time Intervals. *Radiocarbon* 46(2):997-1004.
- Mills, Barbara J.
1999 Ceramics and the social contexts of food consumption in the northern Southwest. In *Pottery and People*, edited by J. M. Skibo and G. M. Feinman, pp. 99-114. University of Utah Press, Salt Lake City.
- Moore, Katherine, Maria Bruno, José Capriles and Christine Hastorf
2007 Integrated Contextual Approaches to Understanding Past Activities Using Plant and Animal Remains from Kala Uyuni. In *Kala Uyuni: An Early Political Center in the Southern Lake Titicaca Basin*, edited by M. S. Bandy and C. A. Hastorf, pp. 113-134. Archaeological Research Facility, No 64. Archaeological Research Facility, University of California, Berkeley.
- Moseley, Michael E.
2001 *The Incas and their Ancestors: The Archaeology of Peru*. Thames and Hudson Inc., New York.
- Mujica, Elias
1978 Nueva Hipotesis Sobre Desarrollo Temprano del Altiplano del Titicaca y de sus Areas de Interraccion. *Arte y Arqueologia* 5-6:285-308.

- 1985 Altiplano-Coast Relationships in the South Central Andes: From Indirect to Direct Complementarity. In *Andean Ecology and Civilization*, edited by C. Morris, pp. 103-140. University of Tokyo Press, Tokyo.
- 1987 Cusipata: Una Fase Pre-Pukara en la Cuenca Norte de Titicaca. *Gaceta Arqueologica Andina* 13:22-28.
- Mujica, Elias and Jane Wheeler
1981 *Produccion y Recursos Ganaderos Prehispanicos en la Cuenca del Titicaca*. Instituto Nacional de Cultura.
- Murra, John V.
1972 El 'control vertical' de un máximo de pisos ecológicos en la economía de las sociedades andinas. In *Visita de la Provincia de León de Huanuco en 1562*, pp. 427-476. Documentos por la Historia y Etnología de Huanuco y la Selva Central. vol. 2. Universidad Nacional Hermilio Valdizán.
- Neff, Hector
1994 RQ-Mode Principal Components Analysis of Ceramic Compositional Data. *Archaeometry* 36(1):115-130.
- 2002 Quantitative Techniques for Analyzing Ceramic Compositional Data. In *Ceramic Production and Circulation in the Greater Southwest: Source Determination by INAA and Complementary Mineralogical Investigations*, edited by D. M. Glowacki and H. Neff, pp. 15-36. Cotsen Institute of Archaeology, UCLA.
- Neira Avendaño, Máximo
1962 Informe preliminar de la expedición arqueológica al Altiplano. In *Kontisuyo: Boletín del Museo de Arqueología e Historia*, pp. 72-80, Arequipa.
- Northrup, David
1978 *Trade Without Rulers: Pre-Colonial Economic Development in South-Eastern Nigeria*. Clarendon Press, Oxford.
- Oberg, Kalvero
1955 Types of Social Structure among the Lowland Tribes of South and Central America. *American Anthropologist* 57(3):472-488.
- Oduor, Chiachin
2008 Seeking missing foods: a methodology for the identification of roots and tubers as important food sources for agrarian and non-agrarian societies. Senior Honors thesis, Department of Anthropology, University of California, Berkeley.
- Ohnstad, Arik T.
2007 Investigaciones en Áreas Periféricas de los Montículos de Wankane y Putuni. In *Khonkho Wanakne: Tercer Informe Preliminar del Proyecto Arqueológico Jach'a*

- Machaca (Investigaciones en 2006)*, edited by J. W. Janusek and V. Plaza Martínez. Viceministerio de Desarrollo de las Culturas, Dirección del Patrimonio Cultural, Unidad Nacional de Arqueología, Universidad de Vanderbilt, La Paz, Bolivia.
- Pearce, Nicholas J. G., William T. Perkins, John A. Westgate, Michael P. Gorton, Simon E. Jackson, Clive R. Neal and Simon P. Chenery
1997 A Compilation of New and Published Major and Trace Element Data for NIST SRM 610 and NIST SRM 612 Glass Reference Materials. *Geostandards Newsletter* 21(1):115-144.
- Peebles, Christopher S. and Susan M. Kus
1977 Some Archaeological Correlates of Ranked Societies. *American Antiquity* 42(3):421-448.
- Peregrine, Peter
1991 Some Political Aspects of Craft Specialization. *World Archaeology* 23(1):1-11.
- Perlès, Catherine, Turan Takaoglu and Bernard Gratuze
2011 Melian obsidian in NW Turkey: Evidence for early Neolithic trade. *Journal of Field Archaeology* 36(1):42-49.
- Plourde, Aimée Marcelle
2006 Prestige Goods are their Role in the Evolution of Social Ranking: A Costly Signaling Model with Data from the Formative Period of the Northern Lake Titicaca Basin, Peru. Ph.D. dissertation, Department of Anthropology, University of California, Los Angeles.
- Plourde, Aimée Marcelle and Charles Stanish
2006 The Emergence of Complex Society in the Titicaca Basin: The View from the North. In *Andean Archaeology III-North and South*, edited by H. Silverman, pp. 237-257.
- Ponce Sangines, Carlos
1990 *El Templete Semisubterráneo de Tiwanaku* 25. Editorial Juventud, La Paz.
- Prentiss, William C. and Ian Kuijt
2004 *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*. University of Utah Press, Salt Lake City.
- Radcliffe-Brown, A. R.
1948 *The Andaman Islanders*. Free Press, Glencoe.
- Ralph, Elizabeth K.
1959 University of Pennsylvania Radiocarbon Dates III. *Radiocarbon* 1(45-58).
- Redmond, Elsa M. and Charles S. Spencer

- 2006 From Raiding to Conquest: Warfare Strategies and Early State Development in Oaxaca, Mexico. In *The Archaeology of Warfare: Prehistories of Raiding and Conquest*, edited by E. N. Arkush and M. W. Allen, pp. 336-393. University Press of Florida, Gainesville.
- Reimer, Paula J, Mike G L Baillie, Edouard Bard, Alex Bayliss, J Warren Beck, Chanda J H Bertrand, Paul G Blackwell, Caitlin E Buck, George S Burr, Kirsten B Cutler, Paul E Damon, R Lawrence Edwards, Richard G Fairbanks, Michael Friedrich, Thomas P Guilderson, Alan G Hogg, Konrad A Hughen, Bernd Kromer, Gerry McCormac, Sturt Manning, Christopher Bronk Ramsey, Ron W Reimer, Sabine Remmele, John R Southon, Minze Stuiver, Sahra Talamo, F W Taylor, Johannes van der Plicht and Constanze E Weyhenmeyer
2004 IntCal04 Terrestrial Radiocarbon Age Calibration, 0-26 cal kyr BP. *Radiocarbon* 46(3):1029-1058.
- Renfrew, Colin
1975 Trade as Action at a Distance: Questions of Integration and Communication. In *Ancient Civilization and Trade*, edited by J. A. Sabloff and C. C. Lamberg-Karlovsky, pp. 3-59. University of New Mexico Press, Albuquerque.

1977 Alternative Models for Exchange and Spatial Distribution. In *Exchange Systems in Prehistory*, edited by T. K. Earle and J. E. Erickson, pp. 71-90. Academic Press, New York.
- Renfrew, Colin and John F. Cherry
1986 *Peer Polity Interaction and Socio-Political Change*. Cambridge University Press, Cambridge.
- Rice, Don Stephen (editor)
1993 *Latin American Horizons: A Symposium at Dumbarton Oaks*. Dumbarton Oaks, Washington, D.C.
- Rice, Prudence
1987 *Pottery Analysis: A Sourcebook*. University of Chicago Press, Chicago.
- Richerson, Peter J. and Robert Boyd
2005 *Not By Genes Alone: How Culture Transformed Human Evolution*. University of Chicago Press, Chicago.
- Richerson, Peter J., Robert Boyd and Robert L. Bettinger
2001 Was Agriculture Impossible during the Pleistocene but Mandatory during the Holocene? A Climate Change Hypothesis. *American Antiquity* 66(3):387-411.
- Rick, John
1987 Dates as Data: An Examination of the Peruvian Preceramic Radiocarbon Record. *American Antiquity* 52(1):55-73.

- Rigsby, Catherine A., Paul A. Baker and Mark S. Aldenderfer
2003 Fluvial history of the Rio Ilave valley, Peru, and its relationship to climate and human history. *Paleogeography, Paleoclimatology, Paleoecology* 194:165-185.
- Roddick, Andrew
2009 Communities of Pottery Production and Consumption on the Taraco Peninsula, Bolivia, 200 BC-300 AD. Ph.D. dissertation, Department of Anthropology, University of California, Berkeley.
- Rowe, John Howland
1942 Sitios Históricos en la Region de Pucara, Puno. *Revista del Instituto Arqueologico, Cuzco* 6(10, 11):66-75.

1944 *An Introduction to the Archaeology of Cuzco*. Peabody Museum, Harvard University.

1956 Archaeological Explorations in Southern Peru, 1954-1955. *American Antiquity* 22(2):135-151.

1967 Stages and Period in Archaeological Interpretation. In *Peruvian Archaeology: Selected Readings*, edited by D. Menzel, pp. 1-15. Peek Publications, Palo Alto.
- Rowe, John Howland and Catherine Terry Brandel
1969 Pucara Style Pottery Designs. *Ñawpa Pacha* 7:1-16.
- Russell, Glenn S., Banks L. Leonard and Jesus Briceno
1998 The Cerro Mayal Workshop: Addressing Issues of Craft Specialization in Moche Society. In *Andean Ceramics: Technology, Organization and Approaches*, edited by I. Shimada, pp. 63-89. MASCA Research Papers in Science and Archaeology. vol. 15, supplement. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.
- Sahlins, Marshall David
1958 *Social Stratification in Polynesia*. University of Washington Press, Seattle,.
- Schiffer, Michael B.
1986 Radiocarbon dating and the "old wood" problem: The case of the Hohokam chronology. *Journal of Archaeological Science* 13(1):13-30.

1990 The influence of surface treatment on heating effectiveness of ceramic vessels. *Journal of Archaeological Science* 17(4):373-381.
- Schortman, Edward M. and Patricia A. Urban
2004 Modeling the roles of craft production in ancient political economies. *Journal of Anthropological Research* 12(2):185-225.

- Schreiber, Katharina J. and Josué Lancho Rojas
1995 The Puquios of Nasca. *Latin American Antiquity* 6(3):229-254.
- Schultze, Carol A., Charles Stanish, David A. Scott, Thilo Rehren, Scott Kuehner and James K. Feathers
2009 Direct evidence of 1,900 years of indigenous silver production in the Lake Titicaca Basin of Southern Peru. *Proceedings of the National Academy of Sciences* 106(14):17280-17283.
- Seddon, Matthew T.
1994 Lithic Artifacts. In *Archaeological Research at Tumatumani, Juli, Peru*, edited by C. Stanish and L. Steadman, pp. 65-71. Fieldiana Anthropology 23. Field Museum of Natural History, Chicago.
- Seltzer, Geoffrey O.
1993 Late-Quaternary Glaciation as a Proxy for Climate Change in the Central Andes. *Mountain Research and Development* 13(2):129-138.
- Seltzer, Geoffrey O. and Christine A. Hastorf
1990 Climatic change and its effect on prehispanic agriculture in the central Peruvian Andes. *Journal of Field Archaeology* 17(4):397-414.
- Service, Elman Rogers
1962 *Primitive Social Organization: An Evolutionary Perspective*. Second ed. Random House, New York.
- Sharratt, Nicola, Mark Golitko, P. Ryan Williams and Laure Dussubieux
2009 Ceramic production during the Middle Horizon: Wari and Tiwanaku clay procurement in the Moquegua Valley, Peru. *Geoarchaeology* 24(6):792-820.
- Sillar, Bill
2000 *Shaping Culture: Making Pots and Constructing Households: An Ethnoarchaeological Study of Pottery Production, Trade and Use in the Andes*. BAR international series. Archaeopress, Oxford.
- Silverman, Helaine and William Harris Isbell
2008 *The Handbook of South American Archaeology*. Springer New York, NY.
- Skibo, James M.
1992 *Pottery Function: A Use-Alteration Perspective*. Interdisciplinary contributions to archaeology. Plenum Press, New York.
- Smith, Monica L.
1997 Strong Economies, Weak Politics: The Archaeology of Central India in the Early Centuries A.D. Ph.D. dissertation, Department of Anthropology, University of Michigan.

- 2010 *A Prehistory of Ordinary People*. University of Arizona Press, Tucson.
- Speakman, Robert J. and Hector Neff (editors)
2005 *Laser Ablation ICP-MS: A New Frontier in Archaeological Characterization Studies*. University of New Mexico Press, Albuquerque.
- Spencer, Charles S.
1993 Human agency, biased transmission, and the cultural evolution of chiefly authority. *Journal of Anthropological Archaeology* 12:41-74.

1998 A Mathematical Model of Primary State Formation. *Cultural Dynamics* 10(1):5-20.

2003 War and early state formation in Oaxaca, Mexico. *Proceedings of the National Academy of Sciences* 100(20):11185-11187.
- Stanish, Charles
1992 *Ancient Andean Political Economy*. University of Texas Press, Austin.

1994 The hydraulic hypothesis revisited: A theoretical perspective on Lake Titicaca Basin raised field agriculture. *Latin American Antiquity* 5(4):312-332.

1997 *Archaeological Survey in the Juli-Desaguadero Region of Lake Titicaca Basin, Southern Peru*. Fieldiana Anthropology. Field Museum of Natural History, Chicago.

2001a Early State Formation in the Lake Titicaca Basin of the South Central Andes. In *Huari y Tiwanaku: Modelos vs. Evidencias, Segunda parte*, edited by P. Kaulicke and W. H. Isbell, pp. 189-215. Boletín de Arqueología PUCP. vol. 5. Pontificia Universidad Católica del Perú, Lima.

2001b The origins of the state in South America. *Annual Review of Anthropology* 30:41-64.

2003 *Ancient Titicaca: The Evolution of Complex Society in Southern Peru and Northern Bolivia*. University of California Press, Berkeley.

2006 Prehispanic strategies of agricultural intensification in the Titicaca Basin of Peru and Bolivia. In *Agricultural Strategies*, edited by C. Stanish and J. Marcus, pp. 364-397. Cotsen Institute of Archaeology, UCLA, Los Angeles.
- Stanish, Charles, Richard Burger, Lisa M. Cipolla, Michael Glascock and Esteban Quelima
2002 Evidence for early long-distance obsidian exchange and watercraft use from the Southern Lake Titicaca Basin of Bolivia and Peru. *Latin American Antiquity* 13(4):444-454.

- Stanish, Charles, Cecilia Chávez, Aimée Plourde and Abigail R. Levine
 2007 A Reevaluation of Northern Lake Titicaca Basin Archaeology. Paper presented at the 47th Annual Meeting of the Institute of Andean Studies. Berkeley.
- Stanish, Charles and Kevin J. Haley
 2005 Power, Fairness, and Architecture: Modeling Early Chiefdom Development in the Central Andes. In *The Foundations of Power in the Prehispanic Andes*, edited by K. Vaughn, D. Ogburn and C. A. Conlee, pp. 53-70. American Anthropological Association, Washington, D.C.
- Stanish, Charles and Abigail Levine
 2011 War and early state formation in the northern Titicaca Basin, Peru. *Proceedings of the National Academy of Sciences* 108(34):13901-13906.
- Stanish, Charles and Lee Steadman
 1994 *Archaeological Research at Tumatumani, Juli, Peru*. Field Museum of Natural History, Chicago.
- Stanish, Charles and A. Umire
 2004 *Prospección Arqueológica del Sector Bajo de la Cuenca del Ramis (Ríos Azángaro y Ramis), Puno*. Instituto Nacional de Cultura, Lima, Peru.
- Steadman, Lee
 1994 Pottery Analysis. In *Archaeological Research at the Site of Tumatumani, Juli, Peru*, edited by L. H. Steadman. Fieldiana Anthropology. vol. 23. Field Museum of Natural History, Chicago.
- 1995 Excavations at Camata: An Early Ceramic Chronology for the Western Titicaca Basin, Peru. Ph.D. dissertation, Department of Anthropology, University of California, Berkeley.
- 1999 The Ceramics. In *Early Settlement at Chiripa, Bolivia*, edited by C. A. Hastorf. University of California Press, Berkeley.
- 2007 Ceramic Analysis In *Kala Uyuni: An Early Political Center in the Southern Lake Titicaca Basin*, edited by M. S. Bandy and C. A. Hastorf, pp. 67-112. Archaeological Research Facility, University of California Berkeley.
- Steponaitis, V.
 1991 Contrasting Patterns of Mississippian Development. In *Chiefdoms: Power, Economy, and Ideology*, edited by T. K. Earle, pp. 193-228. School of American Research advanced seminar series. Cambridge University Press, Cambridge.
- Steward, Julian H.
 1939 Changes in Shoshonean Indian Culture. *The Scientific Monthly* 49(6):524-537.

- 1949 Cultural Causality and Law: A Trial Formulation of the Development of Early Civilizations. *American Anthropologist* 51(1):56-82.
- 1955 *Theory of Culture Change*. University of Illinois Press, Urbana.
- Surovell, Todd
 2003 The Behavioral Ecology of Folsom Lithic Technology. PhD. dissertation, Department of Anthropology, University of Arizona.
- Surovell, Todd A. and P. Jeffrey Brantingham
 2007 A note on the use of temporal frequency distributions in studies of prehistoric demography. *Journal of Archaeological Science* 34:1868-1877.
- Tani, Masakazu
 1994 Why should more pots break in larger households? Mechanisms underlying population estimates from ceramics. In *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, edited by W. A. Longacre and J. M. Skibo, pp. 51-70. Smithsonian Institution Press, Washington, D.C.
- Tapia, Pedro M., Sherilyn C. Fritz, Paul A. Baker, Geoffrey O. Seltzer and Robert B. Dunbar
 2003 A Late Quaternary diatom record of tropical climatic history from Lake Titicaca (Peru and Bolivia). *Paleogeography, Paleoclimatology, Paleoecology* 194:139-164.
- Taylor, Howard E.
 2001 *Inductively Coupled Plasma-Mass Spectrometry: Practices and Techniques*. Academic Press, San Diego.
- Thompson, L. G., E. Moseley-Thompson, W. Dansgaard and P. M. Grootes
 1986 The Little Ice Age as recorded in the stratigraphy of the tropical Quelccaya ice cap. *Science* 234(4774):361-364.
- Trosper, Ronald L.
 2002 Northwest coast indigenous institutions that supported resilience and sustainability. *Ecological Economics* 41(2):329-344.
- Tschopik, Marion H.
 1946 *Some Notes on the Archaeology of the Department of Puno*. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University 27, No. 3, Cambridge.
- Vacher, J. J.
 1998 Responses of two main Andean crops, quinoa (*Chenopodium quinoa* Willd) and papa amarga (*Solanum juzepczukii* Buk.) to drought on the Bolivian Altiplano: Significance of local adaptation. *Agriculture, Ecosystems & Environment* 68(1-2):99-108.
- Vallenas Ramírez, Mauro

- 1992 Procesamiento de la papa amarga en la zona sur del Perú: Elaboración del chuño y tunta. In *La Papa Amarga*, edited by J. Rea and J. Vacher, pp. 93-104. ORSTOM, La Paz, Bolivia.
- Vaughn, Kevin J.
 2000 Archaeological Investigations at Marcaya: A Village Approach to Nasca Sociopolitical and Economic Organization. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara, Santa Barbara.
- 2006 Craft Production, Exchange, and Political Power in the Pre-Incaic Andes. *Journal of Archaeological Research* 14:313-344.
- Vaughn, Kevin J., Christina A. Conlee, Hector Neff and Katharina Schreiber
 2006 Ceramic production in ancient Nasca: provenance analysis of pottery from the Early Nasca and Tiza cultures through INAA. *Journal of Archaeological Science* 33:681-689.
- Vaughn, Kevin J. and Hector Neff
 2000 Moving beyond iconography: Neutron activation analysis of ceramics from Marcaya, Peru, an early Nasca domestic site. *Journal of Field Archaeology* 27:75-90.
- 2004 Tracing the clay source of Nasca polychrome pottery: Results from a preliminary raw material survey. *Journal of Archaeological Science* 31:1577-1586.
- Webster, David
 1998 Warfare and Status Rivalry. In *Archaic States*, edited by G. M. Feinman and J. Marcus, pp. 311-351. School of American Research Press, Santa Fe.
- Weninger, Bernhard
 1986 High-Precision Calibration of Archaeological Radiocarbon Dates. In *Acta Interdisciplinaria Archaeol IV, Nitra*, pp. 11-53.
- White, Leslie A.
 1943 Energy and the Evolution of Culture. *American Anthropologist* 45(3):335-356.
- 1959 *The Evolution of Culture*. McGraw-Hill, New York.
- Whitehead, William T.
 2007 Radiocarbon Dating. In *Kala Uyuni: An Early Political Center in the Southern Lake Titicaca Basin*, edited by M. S. Bandy and C. A. Hastorf, pp. 13-17. Archaeological Research Facility, University of California, Berkeley.
- Williams, Patrick Ryan, Laure Dussubieux, Abigail Levine and Charles Stanish
 2009 Ch'iyar Qala: Basalt Sourcing in the Andean Altiplano, Poster presented at the 74th Annual Meeting of the Society for American Archaeology, Atlanta.

Windes, Thomas C. and Dabney Ford

1996 The Chaco Wood Project: The Chronometric Reappraisal of Pueblo Bonito. *American Antiquity* 61(2):295-310.

Wright, Henry T.

1977 Recent Research on the Origin of the State. *Annual Review of Anthropology* 6:379-397.

1994 Pre-state political formations. In *Chiefdoms and Early States in the Near East: the Organizational Dynamics of Complexity*, edited by G. Stein and M. S. Rothman, pp. 67-84. Undena Press, Malibu.

Wright, Henry T. and Gregory A. Johnson

1975 Population, Exchange, and Early State Formation in Southwestern Iran. *American Anthropologist* 77(2):267-289.