TECHNOLOGICAL STYLES OF LATE POSTCLASSIC SLIPPED POTTERY FROM THE CENTRAL PETÉN LAKES REGION, EL PETÉN, GUATEMALA

By

Leslie G. Cecil

B.A., M.A.

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Philosophy

Department of Anthropology
In the Graduate School
Southern Illinois University
Carbondale

April 2001

UMI Number: 3019249

UMI®

Bell & Howell Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

SIU

Dissertation Approval
The Graduate School
Southern Illinois University

March 23, 2001

I hereby recommend that the dissertation prepared under my supervision by

Leslie G. Cecil

Entitled

The Technological Styles of Late Postclassic Slipped Pottery Groups in the Petén Lakes Region, El Petén, Guatemala

be accepted in partial fulfillment of the requirements for the

DOCTOR OF PHILOSOPHY degree

Prudence M. Rice
In Charge of Dissertation

Jonathan D. Hill
Head of Department

Recommendation concurred in

1. Jonathan D. Hill
2. Charles
3.
4. Richard Fitzsimmons
5.

Committee
for the
Final Examination

AN ABSTRACT OF THE DISSERTATION OF

LESLIE G. CECIL, for the Doctor of Philosophy degree in ANTHROPOLOGY, presented on March 23, 2001, at Southern Illinois University at Carbondale.

TITLE: Technological Styles of Late Postclassic Slipped Pottery from the Central Petén Lakes Region, El Petén, Guatemala

MAJOR PROFESSOR: Dr. Prudence M. Rice

Historical, ethnohistorical, and architectural data suggest that multiple social groups occupied the Petén lakes region of Guatemala during the Postclassic (A.D. 950-1524) and Contact (A.D. 1524-1700) periods. However, no single class of data unambiguously confirms which social group occupied which archaeological site during the Postclassic and Contact periods. Through the comparison of pottery technological style data, I suggest that Petén Postclassic potters produced and reproduced pottery technological styles as part of their social identities.

Five ceramic groups of Postclassic slipped pottery are analyzed from Ch'ich', Tayasal, Ixlú, Zacpetén, Macanché Island, and Topoxté Island in Petén, Guatemala and from Tipuj in Belize in order to identify patterns of technological styles. Decorative styles are examined in terms of technique (e.g., painting and incising), motifs, colors, and form. Technological attributes are studied through "low-tech" analyses (hardness, slip and paste color, and refiring), binocular microscopy, petrography, x-ray diffraction (XRD), energy dispersive spectroscopy (EDS), scanning electron microscopy (SEM), and strong-acid extraction inductively coupled plasma spectroscopy (ICPS) analyses. Descriptive statistics and multivariate analyses of the data identify clusters of co-

occurring variables and help isolate technological styles. When these characteristics are examined together with ethnohistorical, architectural, burial, and decoration color and motif data from archaeological sites in Petén and northern Yucatán, I suggest which social group may have produced which technological style.

This research contributes to the discussion of what style is by combining many of the different views of style proposed by anthropologists, and because it goes beyond analysis of merely surface painting and design. In addition to theoretical significance, this research has methodological significance in that it demonstrates that the analysis of technological style can be operationalized through several types of analyses and that behavioral and technical questions asked by anthropologically-oriented archaeologists can be answered using archaeometric methods.

ACKNOWLEDGMENTS

This dissertation represents many years of pottery analysis in Guatemala and the United States, a critical evaluation of the state of Maya pottery studies, and invaluable advise and guidance from many people that have greatly improved this study.

Foremost, I would like to extend a heartfelt thanks to Prudence M. Rice, my dissertation advisor and a co-principal investigator of Proyecto Maya-Colonial. Her support and guidance with my graduate studies and the many hours of guidance in the pottery laboratory in Flores, Petén and in Carbondale, IL provided a unique opportunity to expand my knowledge of the Maya and pottery analysis. I would like to thank her for taking me under her wings.

I would also like to thank Don S. Rice, a co-principal investigator of Proyecto Maya-Colonial and a member of my dissertation committee, for his support and guidance in Petén and Carbondale. His knowledge of the Maya and our conversations about the Postclassic era were invaluable to my research.

C. Andrew Hofling, a member of my dissertation committee, provided me with the invaluable information about decorative motifs and Maya social organization. I would also like to thank him for his instruction and comments of my dissertation.

Jonathan Hill, a member of my dissertation committee, aided me in the theoretical concerns of my research. His comments on my dissertation are also greatly appreciated.

Richard Fifarek, a member of my dissertation committee, taught me about minerals, clays, and x-ray diffraction. I would like to thank him for introducing some "rouge" archaeologists into the world of clay mineralogy and x-ray diffraction. I also greatly appreciate the time that he spent with me analyzing and re-analyzing my x-ray diffraction data and thin-sections of pottery.

I obtained by pottery sample from Zacpetén which was excavated by Tim Pugh. I want to thank him for his excavation information and for his comments. Rómulo Sánchez-Polo excavated Ixlú. I would like to thank him for his data that pertained to Ixlú as well as for his endless hours of help in Guatemala. Without his kind assistance that ranged from obtaining workers to mundane household activities, I would still be in Petén washing sherds.

SEM and EDS analyses were conducted by Dr. John Bozzola, Dr. Steve Schmitt, and Dee Gates of the Micro-Imaging and Analysis Center at Southern Illinois University at Carbondale. Strong acid-extraction ICPS analysis was conducted under the guidance of Dr. Bradley Paul and Sisir Chaturvedula of the Department of Mining and Engineering at Southern Illinois University at Carbondale. They trained me in these methodologies and I would like to thank them for having faith in an archaeologist. I would also like to thank Kevin Davey for creating Figures 1 and 129.

I would also like to thank Dr. Gloria Greis at the Peabody Museum at Harvard University, Ann Cordell at the Florida Museum of Natural History at the University of Florida, Arlen Chase at Central Florida University, and Bernard Hermes at Yaxhá, Guatemala for allowing me to view the pottery collections from Topoxté Island, Macanché Island, Tayasal, and Topoxté Island (respectively). Their assistance and comments provided information that greatly expanded my research.

The research presented in this dissertation was made possible through funding from Proyecto Maya-Colonial of Southern Illinois University at Carbondale, from the National Science Foundation (Dissertation Improvement Grant SBR-9816325), from Sigma Xi Grants-In-Aid of Research, and from Southern Illinois University at Carbondale in the form of a University Fellowship and a Dissertation Research Award.

This dissertation was conducted as part of Proyecto Maya-Colonial. Don S. Rice, Prudence M. Rice, Grant D. Jones, and Rómulo Sánchez-Polo are the principal investigators of the project and I would like to thank all of them for including me as part of the project. I throughly enjoyed my experience in Petén and am eternally grateful for their support and critical evaluation of my research. In addition to the principal investigators, I would also like to extend my thanks to Miriam Salas who spent many months with me in the laboratory analyzing sherds and recording excavation information. Without her help, the laboratory would not have run as smoothly as it did and I would not have been able to complete my analysis in a timely manner. I would also like to thank Matt Rockmore, Kevin Schwarz, Bill Duncan, and Benito Burgos who also aided in my research and provided laughter in the lab. I would also like to thank IDEAH for allowing me to export my sample of pottery for analysis in the United States.

Finally, I would like to thank my parents for their support, love, and faith in my research and graduate career.

Table of Contents

Abstract i
Acknowledgments iii
Table of Contents vi
List of Tables x
List of Figures xiii

Chapter 1: Introduction 1

Chapter 2: The Petén Lakes Region–The Social Groups and Archaeological Sites 12

Chapter 3: Theory of Style and Technological Style 33
I. Cultural-Historical Analysis of Style 34
II. Processual Analysis of Style 35
II.A. The Social Interaction Theory 36
II.B. The Information Exchange Theory of Style 40
II.C. Wiessner's Emblemic and Assertive Styles 44
II.D. Sackett's Isochrestic Style 46
III. Post-Processualists Analysis of Style 48
IV. Technological Style 53

Chapter 4: Sampling and Methods 64
I. Type-Variety Analysis and Establishment of a Regional Ceramic Complex . . 69
II."Low-tech" Analyses 74
I.A. Color Measurements 74
II.B. Core Colors 76
II.C. Hardness 77
II.D. Surface Treatment and Decoration 79
II.E. Refiring 81
II.F. Form Measurement 82
III. Mineralogical Analyses 82
III.A. Petrographic Analysis 82
III.B. X-ray Diffraction 90
IV. Chemical Analyses 96
IV.A. Energy Dispersive X-ray Spectroscopy (EDS) and Scanning Electron Microscopy (SEM) 97
IV.A.1. Energy Dispersive X-Ray Spectroscopy 97
IV.A.2. Scanning Electron Microscopy 101
IV.B. Strong Acid-Extraction Inductively Coupled Plasma Spectroscopy

(ICPS) 102

Chapter 5: Postclassic Slipped Pottery Classification 113

Chapter 6: "Low-tech" Analyses 257
I. Color Measurements 259
I.A. Slip Colors With Regard to Archaeological Site 260
I.A.1 Zacpetén 260
I.A.2 Ixlú 261
I.A.3 Ch'ich' 261
I.A.4 Tipuj 261
I.B. Slip Colors With Regard to Ceramic Group 266
I.B.1. Paxcamán Ceramic Group 266
I.B.2 Fulano Ceramic Group 266
I.B.3 Trapeche Ceramic Group 266
I.B.4 Topoxté Ceramic Group 271
I.B.5 Augustine Ceramic Group 271
I.C. Diversity of Color Measurements 272
II. Original Hardness 276
III. Firing Conditions 281
III.A. Atmospheric Conditions 281
III.B. Firing Temperatures 286
III.C. Refired Color Diversity at 800 289
III.D. Refired Hardness 295
IV. Form Measurements 300
IV.A. Tripod Plates 300
IV.B Bowls 306
IV.C. Grater Bowls 308
IV.D. Collared Jars 308
IV.E. Narrow Neck Jars 311
IV.F. Drums 315
V. Surface Treatment and Decoration 315
V.A. Surface Treatment 315
V.B. Decoration 316
V.B.1. Hook or Curl 316
V.B.2. Mat Motifs 319
V.B.3. Night Eye 324
V.B.4. Embedded Triangles 326
V.B.5 *Ajaw* Glyph 328
V.B.6 Terraces or Stepped Pyramids 330
V.B.7. Sky Band Motifs 332
V.B.7.a. *Lamat* Glyph 334
V.B.7.b. *Ak'bal* Glyph 336
V.B.7.c. *Zip* Monster 337
V.B.7.d. Beard and Scrolls 337

V.B.8. Bird and/or Feathered Serpent Motifs 338
V.B.9. Miscellaneous Design Elements 341

Chapter 7: Mineralogical Analysis 345
I. Slip Observations 345
II. Petrographic Analysis of the Clay Pastes 346
II.A. Inclusions Present in Petrographic Analysis 347
II.A.1. Quartz SiO_2. 347
II.A.2. Chert SiO_2. 348
II.A.3. Chalcedony SiO_2 348
II.A.4. Hematite Fe_2O_3 349
II.A.5. Biotite $K(Mg, Fe)_3(AlSi_3O_{10})(OH)_2$. 349
II.A.6. Gypsum $CaSO_4 \bullet 2(H_2O)$ 350
II.B.7. Calcite $CaCO_3$. 350
II.A.8. Plagioclase Felspar $CaAl_2Si_2O_8$ or $NaAlSi_3O_8$. 351
II.A.9. Alkali Feldspar Na, K $AlSi_3O_8$. 352
II.A.10. Shell 352
II.A.11. Pores/Voids 352
II.A.12. Fossils 353
II.A.13. Organics 353
II.B. Qualitative Analysis of Clemencia Cream Paste Ware Sherds . . 353
II.C. Qualitative Analysis of Vitzil Orange-Red Ware Sherds 358
II.D. Qualitative Analysis of Volador Dull-Slipped Ware Sherds 363
II.E. Quantitative Analysis of Petrographic Data 367
II.E.1. Ternary Plots of Euhedral, Polycrystalline, and Cryptocrystalline Calcite 368
II.E.2. Ternary Plots of Pores/Voids, Quartz, and Cryptocrystalline Calcite 373
II.E.3. Ternary Plots of Cryptocrystalline Calcite, Quartz, and Hematite 377
II.E.4. Ternary Charts of Pores/Voids, Quartz, and Hematite. 381
II.E.5. Ternary Charts of Cryptocrystalline Calcite, Chalcedony, and Biotite. 385
II. X-Ray Diffraction Analysis 390
II.A. Clays of the Petén Lakes Region 390
II.B. X-Ray Diffraction Analysis of Clemencia Cream Paste and Volador Dull Slipped/Snail Inclusion Ware Raw Clays 396
II.B.1. Clay Samples. 396
II.B.2. Results of X-Ray Diffraction Analysis 397
II.B.2.a. Clemencia Cream Paste Wares 397
II.B.2.b. Zacpetén Raw Clay Sample 397
II.C. Sherds Analyzed 402

Chapter 8: Chemical Analysis Results 425
I. Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Spectroscopy (EDS) analysis 426
II. Strong Acid-Extraction ICPS Analysis 443

Chapter 9: Petén Postclassic Technological Style Groups 471
I.. Technological Style Group 1 474
II. Technological Style Group 2 479
III. Technological Style Group 3 486
IV. Technological Style Group 4 494
V. Technological Style Group 5 502
VI.. Technological Style Group 6 510
VII. Technological Style Group 7 516

Chapter 10: Interpretation of Petén Postclassic Slipped Pottery Technological Styles and Their Relation to Social Groups in the Petén Lakes Region 527
I. Pottery Wares 529
II. Inclusions 531
III. Slips and Firing 534
IV. Pigments and Decoration 537
V. Socio-Political History and Geography 540
VI. Technological Choices and Social Identity 549

Chapter 11: Conclusions 553

References Cited 571

Appendix 606

Vita 608

List of Tables

Table 1: Postclassic Sites, Their Location, Associated Lineages, and Documented Names 15
Table 2: Comparability of Methodologies 68
Table 3: Mohs Scale of Hardness 80
Table 4: Clay Minerals and Temperatures at Which Their Clay Structure Collapses . . . 92
Table 5: Minerals and Their D-Spacing 98
Table 6: Concentration of Elements in Group 1, Group 2, and Group 3 Standards . . . 107
Table 7: Lower Limits for Detection by Plasma Spectrometry 109
Table 8: Postclassic Types and Varieties and the Sites Where They are Located 255
Table 9: Diversity Measurements of Interior Slip Colors 274
Table 10: Diversity Measurements of Exterior Slip Colors 275
Table 11: Interior Surface With Regard to Archaeological Site 278
Table 12: Exterior Surface with Regard to Archaeological Site 278
Table 13: Core Hardness with Regard to Archaeological Site 278
Table 14: Interior Surface Hardness with Regard to Pottery Group 279
Table 15: Exterior Surface Hardness with Regard to Pottery Group 279
Table 16: Core Hardness with Regard to Pottery Group 279
Table 17: Comparison of Firing Core Variation with Regard to Archaeological Site . 284
Table 18: Comparison of Firing Core Variation by Pottery Group 284
Table 19: Core Variation Statistics with Regard to Archaeological Site 285
Table 20: Core Variability Statistics with Regard to Ceramic Group 285
Table 21 : Estimated Firing Temperatures (°C) 288
Table 22: Color Diversity Measurements for Refired Exterior Slipped Surfaces 294
Table 23: Refired Interior Surface Hardness Measurements by Archaeological Site . . 296
Table 24: Refired Interior Surface Hardness Measurements by Ceramic Group 296
Table 25: Refired Exterior Surface Hardness Measurements by Archaeological Site . 297
Table 26: Refired Exterior Surface Hardness Measurements by Ceramic Group 297
Table 27: Refired Core Hardness Measurements by Archaeological Site 298
Table 28: Refired Core Hardness Measurements by Ceramic Group 298
Table 29: Tripod Plate Rim Diameter (cm) Descriptive Statistics 301
Table 30: All Postclassic Tripod Plate Rim Diameter (cm) Descriptive Statistics 304
Table 31: Tayasal Tripod Plate Rim Diameter Descriptive (cm) Statistics 305
Table 32: Macanché Island Tripod Plate Rim Diameter (cm) Descriptive Statistics . . 305
Table 33: Topoxté Island Tripod Plate Rim Diameter (cm) Descriptive Statistics 307
Table 34: Bowl Rim Diameter Descriptive Statistics 307
Table 35: Grater Bowl Rim Diameter Statistics 309
Table 36: Collared Jar Rim Diameter Statistics 310
Table 37: Narrow Neck Jar Rim Diameter Statistics 312
Table 38: Ionic Proportions in Petén Lake Waters 394
Table 39: Basic Characteristics of the Sherd Samples Used for X-ray Diffraction Analysis 404
Table 40: Elements Present in the 10 EDS Groups and the Ceramic Groups Associated with the EDS Groups 428

Table 41: Principal Eigenvalues and Associated Variance 456
Table 42: Rotated Component Matrix and Composition Group Membership 457
Table 43: Mean Elemental Concentration (ppm) of Compositional Groups 463
Table 44: Comparison of ICPS Compositional Groups with Groups formed through Cluster Analysis and EDS analysis and the Ceramic Groups Represented 465
Table 45: Comparison of Preliminary Technological Style Group Data 473
Table 46: Core Hardness Measurements for Technological Style Group 1 476
Table 47: Interior Surface Hardness Measurements for Technological Style Group 1 476
Table 48: Exterior Surface Hardness Measurements for Technological Style Group 1 476
Table 49: Exterior Slip Color Diversity Indices for Technological Style Group 1 478
Table 50: Core Hardness Measurements for Technological Style Group 2 481
Table 51: Exterior Hardness Measurements for Technological Style Group 2 481
Table 52: Interior Hardness Measurements for Technological Style Group 2 481
Table 53: Diversity Measurements of Exterior Slip Colors for Technological Style Group 2 483
Table 54: Core Hardness Measurements of Technological Style Group 3 487
Table 55: Exterior Slip Hardness Measurements of Technological Style Group 3 487
Table 56: Interior Slip Hardness Measurements of Technological Style Group 3 487
Table 57: Diversity Measurements of Exterior Slip Colors for Technological Style Group 3 490
Table 58: Descriptive Statistics for Rim Diameters (cm) of Technological Style Group 3 493
Table 59: Core Hardness Measurements of Technological Style Group 4 496
Table 60: Exterior Slip Hardness Measurements of Technological Style Group 4 496
Table 61: Interior Slip Hardness Measurements of Technological Style Group 4 496
Table 62: Diversity Measurements of Exterior Slip Colors for Technological Style Group 4 499
Table 63: Descriptive Statistics for Rim Diameters (cm) of Technological Style Group 4 501
Table 64: Core Hardness Measurements of Technological Style Group 5 505
Table 65: Exterior Slip Hardness Measurements of Technological Style Group 5 505
Table 66: Interior Slip Hardness Measurements of Technological Style Group 5 505
Table 67: Diversity Measurements of Exterior Slip Colors for Technological Style Group 5 506
Table 68: Descriptive Statistics for Rim Diameters (cm) of Technological Style Group 5 509
Table 69: Core Hardness Measurements of Technological Style Group 6 512
Table 70: Exterior Slip Hardness Measurements of Technological Style Group 6 512
Table 71: Interior Slip Hardness Measurements of Technological Style Group 6 512

Table 72: Diversity Measurements of Exterior Slip Colors for Technological Style Group 6 514
Table 73: Descriptive Statistics for Rim Diameters (cm) of Technological Style Group 6 517
Table 74: Core Hardness Measurements of Technological Style Group 7 519
Table 75: Exterior Slip Hardness Measurements of Technological Style Group 7 519
Table 76: Interior Slip Hardness Measurements of Technological Style Group 7 519
Table 77: Diversity Measurements of Exterior Slip Colors for Technological Style Group 7 521
Table 78: Descriptive Statistics for Rim Diameters (cm) of Technological Style Group 7 524

<u>List of Figures</u>

Figure 1: Postclassic Archaeological Sites and Ethnohistorical Social/Ethnic Groups . . . 2
Figure 2: Stylized Cross-Sections of Fired Cores . . . 78
Figure 3: Percentage Inclusions Estimation Chart . . . 86
Figure 4: Inclusion Sorting Chart . . . 87
Figure 5: Sphericity/Roundness Estimation Chart . . . 88
Figure 6: Montmorillonite Clay Mineral X-ray Diffraction Graph . . . 95
Figure 7: EDS/SEM Beam Dispersion . . . 100
Figure 8: Paxcamán Tripod Plate Profiles . . . 127
Figure 9: Paxcamán Jar Rim Profiles . . . 128
Figure 10: Paxcamán Bowl, Collared Jar, and Miscellaneous Rim Profiles . . . 129
Figure 11: Paxcamán Red: Escalinata Variety Rim Profiles . . . 133
Figure 12: Ixpop Polychrome: Ixpop Variety Rim Profiles . . . 138
Figure 13: Sacá Polychrome: Sacá Variety Rim Profiles . . . 143
Figure 14: Sacá Polychrome: Rasgo Variety Rim Profiles . . . 147
Figure 15: Macanché Red-on-paste: Macanché Variety Rim Profiles . . . 151
Figure 16: Macanché Red-on-paste: Tachís Variety Rim Profiles . . . 155
Figure 17: Picú Incised: Picú Variety Rim Profiles . . . 159
Figure 18: Picú Incised: Thub Variety Rim Profiles . . . 164
Figure 19: Picú Incised: Cafetoso Variety Rim Profiles . . . 168
Figure 20: Fulano Black Rim Profiles . . . 172
Figure 21: Sotano Red-on-paste: Sotano Variety Rim Profiles . . . 176
Figure 22: Mengano Incised: Mengano Variety Rim Profiles . . . 179
Figure 23: Trapeche Pink Tripod Plate Rim Profiles . . . 183
Figure 24: Trapeche Pink Miscellaneous Rim Profiles . . . 184
Figure 25: Mul Polychrome: Manax Variety Rim Profiles . . . 188
Figure 26: Picté Red-on-paste: Picté Variety Rim Profiles . . . 192
Figure 27: Xuluc Incised: Tzalam Variety Rim Profiles . . . 195
Figure 28: Augustine Red Tripod Plate Rim Profiles . . . 200
Figure 29: Augustine Red Jar Rim Profiles . . . 201
Figure 30: Augustine Red Miscellaneous Rim Profiles . . . 202
Figure 31: Pek Polychrome: Pek Variety Rim Profiles . . . 207
Figure 32: Graciela Polychrome: Graciela Variety Rim Profiles . . . 212
Figure 33: Hobonmo Incised: Ramsey Variety Rim Profiles . . . 215
Figure 34: Hobonmo Incised: Hobonmo Variety Rim Profiles . . . 220
Figure 35: Johnny Walker Red Rim Profile . . . 223
Figure 36: Topoxté Red Tripod Plate Rim Profiles . . . 227
Figure 37: Topoxté Red Jar Rim Profiles . . . 228
Figure 38: Topoxté Red Miscellaneous Rim Profiles . . . 229
Figure 39: Pastel Polychrome Rim Profiles . . . 232
Figure 40: Canté Polychrome Rim Profiles . . . 237
Figure 41: Chompoxté Red-on-paste: Kuyakos Variety Rim Profiles . . . 240

Figure 42: Chompoxté Red-on-paste: Chompoxté Variety Rim Profiles 243
Figure 43: Chompoxté Red-on-paste: Akalché Variety Rim Profiles 248
Figure 44: Dulces Incised: Bebeto Variety Rim Profile 253
Figure 45: Exterior Slip Color Distribution According to Archaeological Site 262
Figure 46: Interior Slip Color Distribution According to Archaeological Site 264
Figure 47: Exterior Slip Color Distribution According to Ceramic Group 267
Figure 48: Interior Slip Color Distribution According to Ceramic Group 269
Figure 49: Refired Exterior Slip Color Distribution According to Archaeological Site. 290
Figure 50: Refired Exterior Slip Color Distribution According to Ceramic Group ... 292
Figure 51: Narrow Neck Jar Ratios 314
Figure 52: Hook or Curl Motif 317
Figure 53: Mat or Braid Motifs 320
Figure 54: Night Eye Motif 325
Figure 55: Embedded Triangle Motif 327
Figure 56: *Ajaw* Glyph Motif 329
Figure 57: Stepped Terrace/Pyramid Motif 331
Figure 58: Skyband Motifs 335
Figure 59: Bird Motifs 339
Figure 60: Miscellaneous Motifs 342
Figure 61: Clemencia Cream Paste Ware Sherds 370
Figure 62: Vitzil Orange-Red Ware Sherds 371
Figure 63: Volador Dull-Slipped Ware Sherds 372
Figure 64: Clemencia Cream Paste Ware Sherds 374
Figure 65: Vitzil Orange-Red Ware Sherds 375
Figure 66: Volador Dull-Slipped Ware Sherds 376
Figure 67: Clemencia Cream Paste Ware Sherds 378
Figure 68: Vitzil Orange-Red Ware Sherds 379
Figure 69: Volador Dull-Slipped Ware Sherds 380
Figure 70: Clemencia Cream Paste Ware Sherds 382
Figure 71: Vitzil Orange-Red Ware Sherds 383
Figure 72: Volador Dull-Slipped Ware Sherds 384
Figure 73: Clemencia Cream Paste Ware Sherds 386
Figure 74: Vitzil Orange-Red Ware Sherds 387
Figure 75: Volador Dull-Slipped Ware Sherds 388
Figure 76: X-ray Diffraction Pattern for Clay Sample 11836 398
Figure 77: X-ray Diffraction Pattern for Clay Sample 11846 399
Figure 78: X-ray Diffraction Pattern for Clay Sample Fine 400
Figure 79: X-ray Diffraction Pattern for Clay Sample 11886 401
Figure 80: X-ray Diffraction Pattern for Clay Sample from Zacpetén 403
Figure 81: X-ray Diffraction Pattern for Sherd Sample ZT 8124 406
Figure 82: X-ray Diffraction Pattern for Sherd Sample IA 21831 407
Figure 83: X-ray Diffraction Pattern for Sherd Sample ZT 15666 408
Figure 84: X-ray Diffraction Pattern for Sherd Sample CA 3702 409
Figure 85: X-ray Diffraction Pattern for Sherd Sample IP 25463 410
Figure 86: X-ray Diffraction Pattern for Sherd Sample IP 21870 411

Figure 87: X-ray Diffraction Pattern for Sherd Sample IT 21875 412
Figure 88: X-ray Diffraction Pattern for Sherd Sample ZA 18019 413
Figure 89: X-ray Diffraction Pattern for Sherd Sample IA 23640 414
Figure 90: X-ray Diffraction Pattern for Sherd Sample ZTR 12260 415
Figure 91: X-ray Diffraction Pattern for Sherd Sample ITR 28518 416
Figure 92: X-ray Diffraction Pattern for Sherd Sample CTR 3916 417
Figure 93: X-ray Diffraction Pattern for Sherd Sample TP 143 418
Figure 94: X-ray Diffraction Pattern for Sherd Sample ITR 20463 419
Figure 95: X-ray Diffraction Pattern for Sherd Sample ZT 7181 420
Figure 96: SEM and EDS Data for ZP 10797 429
Figure 97: SEM and EDS Data for IP 20591 430
Figure 98: SEM and EDS Data for ITR 20463 431
Figure 99: SEM and EDS Data for IT 30499 432
Figure 100: SEM and EDS Data for TT 51 433
Figure 101: SEM and EDS Data for TT 6262 434
Figure 102: SEM and EDS Data for IA 21816 435
Figure 103: SEM and EDS Data for CA3690 436
Figure 104: SEM and EDS Data for TA 611 437
Figure 105: SEM and EDS Data for TA 768 438
Figure 106: SEM and EDS Data for Montmorillonite Clay Sample 439
Figure 107: SEM and EDS Data for Kaolinte Clay Sample 440
Figure 108: SEM and EDS Data for Halloysite Clay Sample 441
Figure 109: Cluster Analysis of Elemental Concentrations 450
Figure 110: Chemical Composition Groups 458
Figure 111: Composition Groups 4 and 5 458
Figure 112: Fe an Al Concentrations 459
Figure 113: Ca and Fe Concentrations 460
Figure 114: Ca and Zn Concentrations 461
Figure 115: Ti and Fe Concentrations 462
Figure 116: Exterior Slip Color Distribution of Technological Style Group 1 477
Figure 117: Exterior Slip Color Distribution of Technological Style Group 2 482
Figure 118: Technological Style Group 2 Sherd Profiles 484
Figure 119: Exterior Slip Color Distribution of Technological Style Group 3 488
Figure 120: Technological Style Group 3 Sherd Profiles 491
Figure 121: Exterior Slip Color Distribution of Technological Style Group 4 497
Figure 122: Technological Style Group 4 Sherd Profiles 498
Figure 123: Exterior Slip Color Distribution of Technological Style Group 5 503
Figure 124: Technological Style Group 5 Sherd Profiles 507
Figure 125: Exterior Slip Color Distribution of Technological Style Group 6 513
Figure 126: Technological Style Group 6 Sherd Profiles 515
Figure 127: Exterior Slip Color Distribution of Technological Style Group 7 520
Figure 128: Technological Style Group 7 Sherd Profiles 523
Figure 129: Technological Style Groups and Their Presence at Archaeological Sites in the Study 526

CHAPTER 1

INTRODUCTION

On-going research into the Postclassic (A.D. 950-1524) and Contact (A.D. 1524-1700) periods in the Maya lowlands of Petén, Guatemala (Jones 1989, 1996, 1998; Jones et al. 1981; D. Rice 1986, 1988; Rice and Rice 1981, 1984, 1990; P. Rice 1979, 1986, 1987a, 1996a, 1996b, 1996c; Rice et al. 1996) reveals a situation of changing alliances, changing dominance relations, and repeated migrations of social/ethnic groups. Numerous ethno-socio-political groups may have co-existed in the Petén lakes region in the Late Postclassic period, but at the time of the Spanish conquest in A.D. 1697 two dominated, the Itzá and the Kowoj (Jones 1998) (Figure 1). Each had a principal province headed by a leader at a provincial capital, controlled different subprovinces, and had distinct origin and migration myths. Because of these archaeologically and ethnohistorically documented socio-political differences, I compare the Petén Postclassic slipped pottery technological style data from Ch'ich', Tayasal, Ixlú, Zacpetén, Macanché Island, Topoxté Island, and Tipuj to examine the proposition that potters in the Itzá and the Kowoj provinces produced and reproduced pottery technological styles as part of their social identities during the Postclassic and Contact periods.

The Itzá controlled the southern and western basin of Lake Petén Itzá, an area stretching from Lake Quexil west to Lake Sacpuy, with their capital, Nojpeten or Taj Itzaj, on modern Flores Island (Jones, Rice, and Rice 1981) (Figure 1). Their ruler, Kan

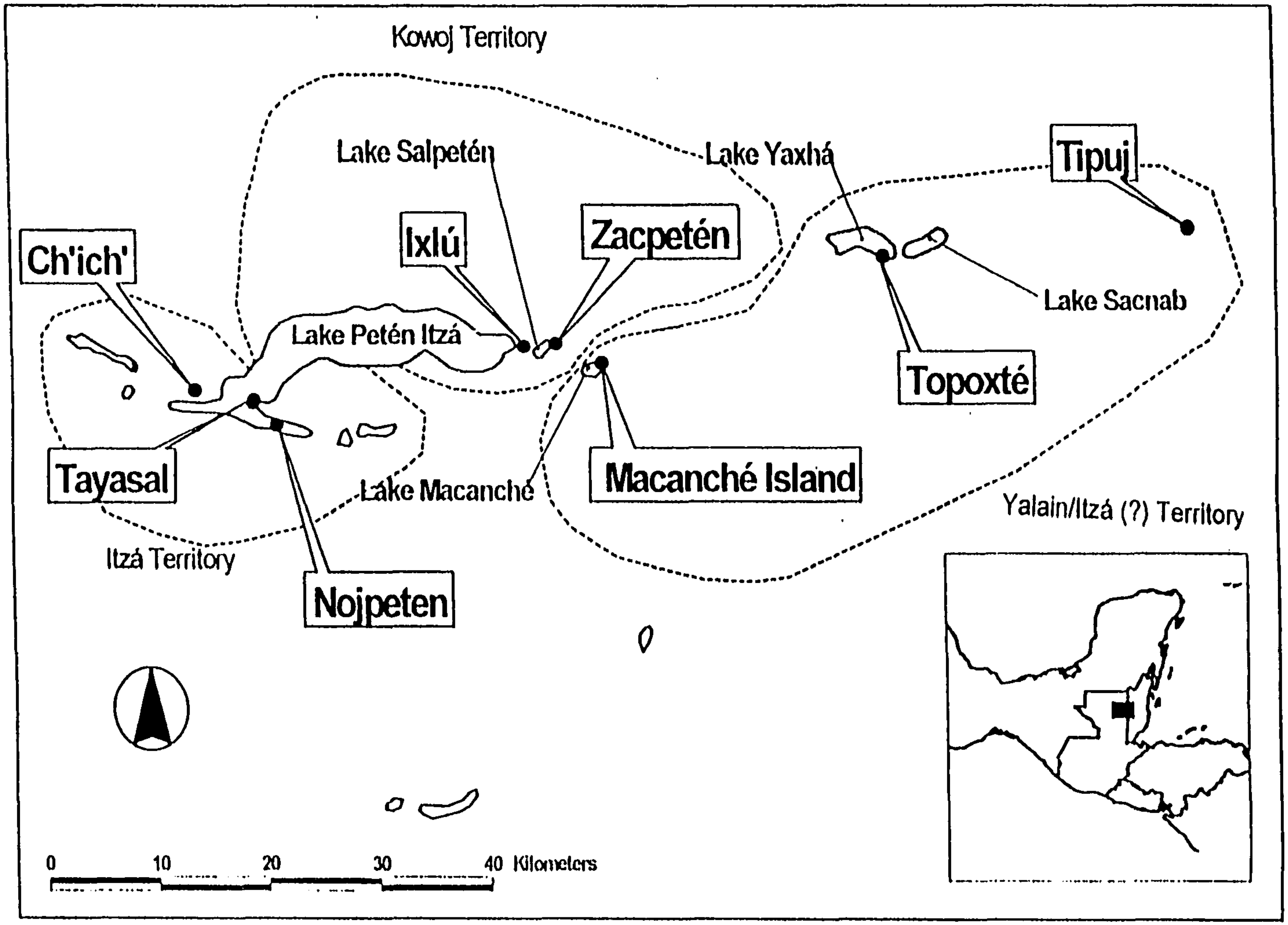


Figure 1: Postclassic Archaeological Sites and Ethnohistorical Social/Ethnic Groups discussed in text (adapted from Jones 1998:Map 3).

Ek', claimed ancestry from Chich'en Itza and stated that the Itzá migrated from the Yucatán peninsula when Chich'en Itza fell. The Kowoj claimed ancestry from Mayapán and migrated to central Petén after that city fell (Jones 1998). Kowoj patronyms and matronyms were held by prestigious individuals at Mayapán (e.g., the "guardian of the east gate") (Roys 1967:79). Late in the Contact period, the Kowoj occupied territory from the northern basin of Lake Petén Itzá to Lake Salpetén and had their province capital at Saklamakhal (probably in the eastern port region around the sites of Ixlú and Zacpetén) (Figure 1) (Jones 1998:66). Differing identities, Itzá and Kowoj, may be expressed in civic-ceremonial architecture (Pugh 1995, 1996; Rice, Rice, and Pugh 1997), burial practices (Duncan, personal communication 2000), and slipped pottery (Cecil 1999, 2000a, 2000b).

Initial archaeological results are consistent with the socio-political regionalization suggested by Spanish documents. Although Spanish documents suggest that many social groups lived in the Petén lakes region during the 17th and 18th centuries, data gathered by Proyecto Maya-Colonial detected the east-west socio-political differences between the Itzá and the Kowoj, respectively, based on differences in architecture, burial practices, and pottery. Further excavations and analyses of archaeological sites in the Itzá territory and other social group territories will undoubtedly enhance the current knowledge of the socio-political differences described in Spanish documents.

In this context, it is important to make use of the Postclassic and Contact period pottery of the lakes area to delineate differences among social identities, especially between sites/territories of the Itzá and the Kowoj. One way to accomplish this is through the analysis of "technological styles" of this pottery. "Technology" is seen here as the operational sequence of choices of manufacture that include decisions concerning matter (clay), energy (the forces that move and transform matter), objects (artifacts), human gestures (the movement of raw materials involved in manufacture), and specific knowledge (the "know-how" that produces the end product that is a result of all possibilities and choices for technological action or social representations) (Lemonnier 1992:5-6). "Style" refers to the "visual representations, specific to particular contexts of time and place, that at the least transmit information about the identity of the society that produced the style and about the situation or location where it appears" (Rice 1987b: 244). The visual representation can be painted, incised, appliqued, or modeled. By determining the existence of distinct Petén Postclassic technological styles, one can explore how technological differences in pottery manufacture and decoration can combine to constitute analytically different classes (i.e., technological styles) of pottery.

Pottery from the five slipped Petén Postclassic ceramic groups (Paxcamán, Fulano, Trapeche, Augustine, and Topoxté) are analyzed here employing the theory of technological style as defined by Lechtman (1977). I use Lechtman's concept of technological style to explore the technological and decorative variability of material culture (Lechtman 1977, 1979, 1981, 1984a, 1984b, 1988, 1993, 1994; Lemonnier 1986, 1989, 1992, 1993; Stark 1998; Wright 1985). Technological and decorative variability results from the relationships between decorative elements and the patterns people produce through various behaviors. When creating material objects, the producer may have many choices (operational sequences) to make that reflect the social and cultural constructs that underlie and direct her/his actions, and subtle differences in a choice (e.g., matter, energy, motor patterns, etc.) can influence the social representation of material culture (Lemonnier 1992:23, 1993:9; Lechtman 1977:6). Therefore, both the material and the process of manufacture contribute to an object's style as much as does the surface decoration because technological acts are embedded in a symbolic system that reflects social reality and indigenous knowledge.

Preliminary definitions of technological styles of Petén Postclassic slipped pottery are developed by means of analysis of pottery excavated from Ch'ich', Ixlú, and Zacpetén in Petén, and Tipuj in Belize. Existing collections of pottery from Tayasal, Topoxté Island, and Macanché Island (excavated earlier and/or by other projects) are then examined visually to determine if the same patterns of technological styles hold true for the entire region or if different technological styles can be distinguished at these sites. Sherds from these sites could only be visually examined because the collections are curated at other locations.

In order to identify patterns of Postclassic technological styles from pottery at Ch'ich', Ixlú, Zacpetén, and Tipuj, several kinds of analysis are conducted to gather technological and stylistic data: type-variety analysis, "low tech" analyses, mineralogical analyses, and chemical analyses.

The first level of analysis consists of typological analysis using the type-variety system (Smith, Willey, and Gifford 1960). This hierarchical system uses a series of categories–ware, group, type, and variety in descending inclusiveness–to organize levels of variability in archaeological pottery. All Postclassic slipped sherds from Ch'ich', Tayasal, Ixlú, Zacpetén, Macanché Island, Topoxté Island, and Tipuj are classified as to ware, ceramic group, type, and variety (where possible) (Chapter 5). For purposes of studying technological styles, it is particularly useful to consider pottery at the ware level.

Ware definitions are based primarily on paste attributes and surface finish, but also convey information about geographical location, time period, decoration, and function (Rice 1982:50). Differences at the ware level with regard to general paste characteristics such as color and inclusions, surface finish, decoration, quantities of form categories, and overall technology occur in this sample. The differences discussed in Chapter 5 are not numerous, but it is these small differences in wares and decorative modes that prove to be important when discussing the technological styles and social identity of groups in the central Petén lakes region. Because technological styles incorporate the relation of designs to patterns people produce through various acts, they distinguish the style of a particular category of material culture. The decorative aspects of design, whether a simple color or intricate combinations of motifs and elements, are a product of the behavior of the producers of that object. Thus, it is the integration of behavioral events at each level of manufacture that defines technological style.

My use of "design" through this research refers to the planned creation of a pattern (e.g., the placement of a series of curls or hooks to indicate the level of the watery Underworld). This is different from my use of "decoration" which refers to the painted, incised, appliqued, or modeled visual representation (e.g., a curl or hook motif). The use of technological styles focuses on the use of decoration in conjunction with technological characteristics of pottery.

The second level of analysis, "low tech" analysis, includes slip and clay paste color measurements, degree of dark coring, hardness measurements, surface treatment and decoration sequence identification, vessel form measurements, and refiring experiments (Chapter 6). As a result of differences in paste and surface characteristics, I define three general and preliminary technological styles that correlate to differences in the three ceramic wares of this study. These groups reflect differences in diversity indices of slipped surfaces, slipped surface characteristics such as double slipping and "waxy" surface finishes, and firing technologies. Technological style groups based on observations at this level of analysis suggest that Itzá and Kowoj potters made choices based on matter (clay and slip), energy (surface finish and decoration), and specific knowledge ("know-how," such as firing technology and surface finishes).

Mineralogical analysis, the third level of analysis, identifies the clay minerals, non-plastic inclusions, minerals, and rock fragments in a clay paste as well as slips on the vessel surface (Chapter 7). In order to gather this data, I conducted petrographic and x-ray diffraction analyses. Petrographic analysis allows for the identification of minerals by means of their unique optical properties and provides qualitative (shape and sorting) and quantitative (size and frequency) data for comparison at the ware level. Percentages of pores and inclusions in the clay paste are characterized through the comparison of various tables and ternary charts. Because petrographic analysis does not reveal the full mineralogical composition of a pottery sample, it is combined with x-ray diffraction analysis to identify clay minerals by their crystalline structure. X-ray diffraction also provides data on the presence of other minerals, such as gypsum and feldspar, that may have been difficult to identify through petrographic analysis.

Mineralogical analyses lead to the definition of four technological style groups based on the characteristics of the clay pastes: 1) clay pastes dominated by voids (Vitzil Orange-Red and Clemencia Cream Paste wares); 2) clay pastes dominated by cryptocrystalline calcite inclusions (Volador Dull-Slipped and Vitzil Orange-Red wares);

3) clay pastes with quartz, chert, chalcedony, hematite, and calcite mineral inclusions (Volador Dull Slipped, Vitzil Orange-Red, and Clemencia Cream Paste wares); and 4) clay pastes that include quartz, chert, chalcedony, hematite, calcite, and biotite minerals (Volador Dull-Slipped, Vitzil Orange-Red, and Clemencia Cream Paste wares). X-ray diffraction of sherd samples does not provide additional data to further differentiate the four groups because all sherd samples included montmorillonite and halloysite clay minerals. Technological style groups developed at this level of analysis suggest that Petén Postclassic Maya potters made choices based on matter (such as clays with different mineral suites) that may have been influenced by the socio-political milieu of contested boundaries during the Postclassic period.

The final level of analysis, chemical analysis, involves energy-dispersive spectroscopy (EDS), scanning electron microscopy (SEM), and strong acid-extraction inductively coupled plasma spectroscopy (ICPS) analyses (Chapter 8). Chemical analyses provide information on the elemental composition of the clay paste that, when combined with the other levels of analysis, provides a powerful tool of interpretation. EDS and SEM analyses are employed because x-ray diffraction analysis is not able to detect clay minerals fired above 450°C as a result of changing crystalline structures. EDS analysis produced clay groups based on various intensity peaks of the most common elements in the clay pastes. SEM analysis provided comparable images that further grounded the EDS clay groups. Strong acid-extraction ICPS analysis is conducted to determine the elemental and composition groupings of the pastes that resulted from different clay resource choices during manufacturing.

EDS and SEM analyses produced 10 elemental groups and strong-acid extraction

ICPS analysis produced seven chemical composition groups. EDS and SEM elemental groups reflect the differences between Volador Dull-Slipped and Vitzil Orange-Red ware pottery and Clemencia Cream Paste ware pottery because Volador Dull-Slipped and Vitzil Orange-Red ware pottery share a similar elemental suite. Strong-acid extraction ICPS analysis resulted in seven chemical compositional groups that represent different pottery wares. The elemental differences demonstrate choices in clay and/or mineral resources and possibly knowledge of the clays and minerals used by Maya potters.

When data from the four levels of analysis are examined together, seven technological style groups occur that reflect differences in choices made at the technological and decorative levels (Chapter 9).

As a result of many levels of analysis and methodologies, it is possible to determine the existence of multiple technological styles of Petén Postclassic slipped pottery. By comparing these data with architectural, burial, and additional pottery stylistic characteristics, it is possible to suggest which social/ethnic groups produced which technological style of pottery. This research builds on 20 years of archaeological research into Postclassic sites and pottery in the Petén lakes region to investigate the material representations of Maya identities by demonstrating that potters in the Itzá and the Kowoj provinces produced and reproduced pottery technological styles as part of their social identities during the Postclassic and Contact periods.

The technological styles of Petén Postclassic pottery discovered through this analysis demonstrate that: 1) technological and stylistic choices have a social context; 2) technology and style are social reproductions of Postclassic society; 3) some technological and stylistic choices were more compatible than others within Postclassic

Maya society; 4) technology affects style; and 5) these compatible choices reinforced the existing technology and social ideology. Similarities of formal arrangements of technological and stylistic patterns contribute to the assessment of the social/ethnic identities and histories of different social groups in Postclassic and Contact period Petén. By identifying distinct technological styles associated with different ceramic groups and/or archaeological sites, it is possible to refine our understanding of the settlement and socio-political relations of the Itzá and the Kowoj in Petén.

My research based on technological style contributes to the discussion of what constitutes "style" first because it combines many of the different views of style proposed by archaeologists and anthropologists, and second because it goes beyond analysis of only surface painting and decoration. Technological style incorporates aspects of technological choices in manufacture as well as decorative elements that are commonly considered "stylistic." The conjunction of technology and style in material culture provides additional means by which anthropologists can discuss social identity and social boundaries.

Finally, this research has methodological significance in that it demonstrates that the analysis of technological style can be operationalized through the use of type-variety analysis, "low tech" analyses, mineralogical analyses, and chemical analyses. It shows that behavioral and technical questions asked by anthropologically-oriented archaeologists can be answered by using archaeometric methods. This is important because archaeologists and archaeometrists frequently focus on different topics of interest. As a result, the archaeometrists' techniques often do not provide the information necessary to answer archaeological and anthropological questions. However, this use of technological style and methods of analysis demonstrates one of the ways that archaeometric methods can be effectively used in anthropological research.

CHAPTER 2

THE PETÉN LAKES REGION–THE SOCIAL GROUPS AND ARCHAEOLOGICAL SITES

The Maya occupied the Petén lakes region from the beginning of the Middle Preclassic (600 B.C.) throughout the Classic (A.D. 250-900) and Postclassic (A.D. 900-1524) periods to the present. During this broad time span, Maya material culture changed due to contact with other social groups, changing environmental conditions, and a changing political milieu that ultimately, by the end of the Classic period (ca. A.D. 900), resulted in population consolidation and reorganization around easily defendable lands near water sources. The Postclassic period defines the final period in pre-conquest Maya history.

Scholars propose two different views of socio-political organization during the Postclassic period. The first is based primarily on archaeological evidence-- pottery and other categories of material culture-- and proposes a time of great regionalization between the Terminal Classic period and the Historic period. This socio-political reconstruction of the central Petén lakes region is based on archaeological research carried out in the 1960s through the 1980s by Adams (1971), Bullard (1960, 1970, 1973), Chase (1979, 1983, 1985), Cowgill (1963), Rice (1979, 1985, 1986, 1987a, 1996a), and others. They suggested that from the Terminal Classic period to the Historic period, pottery types and other categories of material culture that correlate to changes in social and political organization demonstrate regional variability. Differences in quality and quantity of various pottery types and architectural features may have resulted from changes in Maya society as populations relocated in the central Petén lakes region from surrounding areas after the Late Classic collapse (D. Rice 1986).

The second, and more recent, view of socio-political organization during the Postclassic period is informed by Spanish documents and ethnohistories that illuminate the situation primarily from approximately A. D. 1450-1700 (Jones 1998). It reveals a situation of changing alliances, changing dominance relations, and repeated migrations of social/ethnic groups during the Late Postclassic and Contact (A.D. 1525-ca. 1697) periods in the Maya lowlands of Petén, Guatemala. It proposes that Petén was divided into administrative provinces headed by and named after a dominant lineage and each lineage controlled several subprovinces or territorial regions throughout the area. As a result of expansionistic tendencies, socio-political boundaries were contested (Jones 1998). The Kejach, Mopan, Yalain, Itzá, and Kowoj occupation in the Petén lakes region may have resulted in conflict between the social groups, especially among the Yalain, Kowoj, and Itzá, and social and political boundaries may have been created to enhance and enforce social differences. Dialect differences may also have existed to distinguish Itzá and Kowoj social groups (Hofling, personal communication 1997). In addition to possible dialect differences, civic-ceremonial architecture also differs. Zacpetén, an archaeological site in the Kowoj territory, has architecture that resembles Mayapán temple assemblages (Pugh 1996), while Ch'ich', an archaeological site in the Itzá territory, has architecture different from Zacpetén (Rice et. al. 1996). Yalain, an archaeological site in the Yalain territory, has architecture that is different from both Zacpetén and Ch'ich' (D. Rice, personal communication 2000).

Pottery in different regions shows great variability with a multitude of paste varieties, the introduction of new pottery types, and changes in form and size of vessels (Rice 1979, 1987a). For example, Chase (1983) states that the pottery at Tayasal differs in degree and kind from the pottery at Macanché Island analyzed by Rice (1987a). However, if one is to believe the socio-political reconstruction of the central Petén lakes region at the time of the Spanish conquest based on Spanish documents and ethnohistories, both sites are potentially within the Yalain/Itzá territory and may be more likely to have similar categories of material culture including pottery (Jones 1998:Map 3).

The above views of socio-political organization are based on Kejach, Mopan, Yalain, Itzá, and Kowoj interactions. Each social group and excavated archaeological sites within their ethnohistorically defined territorial boundaries are presented below. In addition to this information, Table 1 (after Rice et. al. 1996:Table 3) presents known Postclassic and Historic period archaeological sites in the Petén lakes region, their location with regard to the different lakes, their relation to proposed lineage territories, and their ethnohistorically documented names.

The Kejaches occupied the area to the north of the Petén lakes during the 16th and 17th centuries, but may have arrived as early as the 15th century (Jones 1998:23; 1996:13). Although a large area of uninhabitable land separated their homeland from the Itzá and Lake Petén Itzá, the Itzá frequently attacked the Kejaches. As a result, the Kejaches aided Cortés, Avendaño, and other Spanish conquistadores through their

Table 1: Postclassic Sites, Their Location, Associated Lineages, and Documented Names

Archaeological Site	Lake	Lineage Territory	Documented Name
Islas de Sacpuy	Sacpuy	Kan Ek' (Itzá)	Chun Ajaw
Pasajá	Petén Itzá (S.W.)	Kan Ek' (Itzá)	Unknown
Colonia Itzá	Petén Itzá (S.W.)	Kan Ek' (Itzá)	Unknown
Nixtun Ch'ich *	Petén Itzá (W.)	Kan Ek' (Itzá)	Ch'ich'
Ixlú*	Petén Itzá/Salpetén	Yalain (Disputed)	Saklamakhal/ Chaltunha'
Zacpetén*	Salpetén	Kowoj	Sakpeten
Yalain*	Macanché	Yalain	Yalain
Muralla de Leon*	Macanché	Yalain/Kowoj	Makanche'
Chachaclún	Petén Itzá (N.)	Kowoj	Unknown
San Pedro	Petén Itzá (N.)	Kowoj	Unknown
Uxpetén	Petén Itzá (N.)	Kowoj	Uxpetén
El Astillero	Petén Itzá (N.)	Kowoj	Unknown
Jobompiche I	Petén Itzá (N.)	Kowoj	Unknown
Piedra Blanca	Petén Itzá (N.)	Kowoj	Unknown

* indicates archaeological sites discussed below.

territory in their attempts to reach Petén and conquer the Itzá (Jones 1998:154-160).

According to Jones (1989:9), the Kejaches may have been "a collection of refugee polities made up predominantly of runaways from the *encomiendas* of northern Yucatan." They had a "lord" and representative of other large towns of the Kejach territory "each of which was a *cabecera*, a provincial capital" (Jones1998:32). The Spanish *entradas* into Petén encountered Kejach hamlets, some of which were fortified by a wooden wall and ditch; however, the hamlets were abandoned before the Spanish arrived (Cortés 1976:240). Finally, the Kejaches shared common surnames with the Itzá, such as B'alam, B'atun, Chan, and Puk, which suggests possible social and/or political Itzá connections (Jones 1998:Table 1.1).

The Mopan occupied territory south and southeast of the central Petén lakes region near the current Guatemala-Belize border (between the archaeological sites of Topoxté and Tipuj), the Belize River Valley, and parts of southern Belize (Jones 1998:5, 22). According to Jones (1998:22), "Fuensalida's report of a sizable fortified Chinamita town suggests that at least some Mopans lived in larger communities that were 'capitals' of politically centralized territories" as well as scattered settlements. Scattered settlements may have been a result of battles with the Itzá and Spanish invasions. Jones (1998:21,101) states that the Mopan may have defeated the Itzá in battle on three occasions and temporarily gained control of the corridor to Tipuj. In 1697, the Mopans were part of the Itzá territory and they and Itzá fought together "against Spanish penetration into adjacent Chol communities" (Jones 1998:22,99).

The other three socio-political groups, the Yalain, the Itzá, and the Kowoj, are better known through historical documents and appear to be the dominant ethno-socio-political groups in the central Petén lakes region during the Postclassic and Contact periods. Sometime during the Postclassic period, the Yalain may have had their own territory that stretched from the east shore of Lake Petén Itzá to Tipuj (Jones 1998:Map 6). The Chan family, originally from Nojpeten, ruled Yalain (Jones 1998:55, 66, 95). As a result of various marriage alliances and possible territorial wars, the Yalain territory became an outpost area for the Itzá in order to protect the Itzá from the Spanish on their eastern border. However, by 1695, the Itzá-Kowoj marriage alliance broke and Ajaw B'atab K'in Kante, the lineage head of Yalain, "had declared war against the Itzá ruler in an alliance with the Kowojs, now claiming control even over the Yalain region" (Jones 1998:167).

The Yalain territory may have included the archaeological sites of Yalain, Topoxté, Macanché Island, and Tipuj. However, only Yalain and Macanché Island are presented below. Topoxté Island is discussed in the Kowoj section due to its architectural and ceramic affinities to Zacpetén–a presumed Kowoj site, and Tipuj is discussed in the Itzá section due to its ethnohistorically known connections to the Itzá of Nojpeten.

Yalain is located 3 km from Lake Macanché on the northwestern lake shore. Jones (1998:66) believes that the town of Yalain was the center of subsistence production for the inhabitants of Nojpeten and "at one point served as the principal Itzá administrative center of the region." The architecture and pottery from Yalain date from the Middle Preclassic to the Late Postclassic period. The Postclassic period architecture is dominated by a north-south oriented ceremonial center construction in which a large open hall or temple faces two to three smaller open halls (D. Rice, personal communication 2000). Numerous small residential groups consisting of open halls and other Postclassic architecture surround the ceremonial center. This pattern is not typical of Mayapán temple assemblages (Proskouriakoff 1962) found in northern Yucatán and Kowoj sites in the Petén (Pugh 1996; D. Rice, personal communication 2000). Dates of the site were obtained from surveys by Bullard (1960) and the Cental Petén Historical Ecological Project (hereafter CPHEP) (D. Rice 1986; P. Rice 1986; among other publications).

Macanché Island is located in Lake Macanché and was first excavated by Bullard in 1968 (Bullard 1970, 1973; Rice 1987a). Pre-colonial construction occurs on the northeast end of the island at its highest point (Rice 1987a:12). Bullard's surveys and excavations indicate that the island was continuously occupied from the Late Classic period through the Postclassic period. All but one of his eight test pits/operations were located around the periphery of the mound. The eighth test pit was located 9 m to the southeast of the mound.

Test pit excavations and contour mapping by CPHEP expanded Bullard's excavations in 1968. Their excavations confirmed Bullard's proposition that Macanché Island was occupied from the Late Classic to the Postclassic periods, but indicated that occupation occurred primarily during the Postclassic period (Rice 1987a:2, 33). "Although the island has suffered modern disturbance, and there is little architectural trace of the structure or structures that may have been built upon the mound, the available evidence suggests that the use of Macanché Island was probably principally residential," but ceremonial artifacts (incensarios) indicated ritual activities (Rice 1987a: 33).

The Terminal Classic Maya constructed a low platform on the highest point of the island with three areas of activity: two deposits with reconstructable vessels and a modification of a low platform (Rice 1987a:33-34). Early Postclassic activity resulted in a 80 cm high large platform over the Terminal Classic platform (Rice 1987a:41). A structure located in the northwest portion of the island, a structure located in the central portion of the island and built over the Early Postclassic platform, and a refuse midden on the west side of the structure in the center of the island indicated Late Postclassic occupation of Macanché Island (Rice 1987a:41-43). In addition to architecture and pottery, CPHEP encountered twelve west-facing crania in two rows in the fill of a "non-descript mound on the mainland" (P. Rice 1986:264).

The Itzá, who were likely an alliance of socio-political groups, are said to have controlled the southern and western basin of Lake Petén Itzá stretching from Lake Quexil to Lake Sacpuy with their capital at Nojpeten or Taj Itzá, which was located on the modern island of Flores (Jones 1998:Map 3; Jones, Rice, and Rice 1981). They claimed ancestry to the archaeological site of Chich'en Itza in northern Yucatán and are said to have migrated from there to the Petén lakes region before the Spanish conquest (Jones 1998:11).

According to the *Chilam Balam of Chumayel* (Edmonson 1986; Roys 1933), the Itzá fled from Chakanputun to the forest or Chich'en Itzá between A.D. 1185-1204 (Roys 1962:43). Edmonson (1986) and Roys (1962) stated that the Itzá then returned to Chich'en Itza after two *k'atuns* of exile. Mayapán was founded and ruled by the Itzá lineage of the Kokom in A.D. 1263/83 (Roys 1962:43). At this time, the earliest structures in the Mayapán ceremonial core that resemble those from Chich'en Itza were constructed: the Castillo-like center temple, serpent-column facades, colonnaded halls, and small sacrificial altars (Proskouriakoff 1962:133). In A.D. 1362/82, a revolt brought the Kokom into power at Mayapán and they may have shared a joint rule with the Xiu in

A.D. 1421/41 (Roys 1962:44-46). However, problems soon arose for the Kokom. The *Chilam Balam of Chumayel* (Edmonson 1982) states that Hunac Ceel, a Mayapán lord and possibly of Kokom lineage, created a love charm that allowed Chac Xib Chac to abduct the bride of the ruler of Izamal during a wedding ceremony. This scandal resulted in the expulsion of the Itzá from Chich'en Itza. Roys (1962:47) notes that the ruler of Chich'en Itza, presumably the Kokom lineage ruler at Mayapán, and other followers "fled by sea down the east coast, and went inland to Lake Petén" and settled at Tayasal and this may indicate an earlier migration of the Itzá to Petén. Edmonson (1986:58) also states that a migration occurred after the destruction of Mayapán and "they went to the heart of the forest, Tan Xuluc Mul by name." As a result of the expulsions, Kokom rulership at Mayapán ended, Mayapán was destroyed, and nobles carrying codices and building temples in their "homelands" created 16 independent states (Roys 1962:47; Tozzer 1941:38, 98). In the end, the Kokom remained in eastern Yucatán and the Xiu in western Yucatán. Kokom patronyms, such as Balam, Chan, and Tun, were most numerous in the 16th century provinces of Sotuta and Mani (Roys 1957:Table 1).

Although migration myths in the *Chilam Balam of Chumayel* (Roys 1933:74, 147; Edmonson 1986:92, 135) stated that the Itzá came from northern Yucatán during the Late Postclassic period at approximately A.D. 1450, Rice et al. (1996) and Schele and Grube (1995) and Schele and Mathews (1998) believe that the migration during the Late Postclassic period was only one of many migrations of portions of the population to the Petén lakes region from northern Yucatán. The migrations from the Petén lakes region to Chich'en Itza may have been the result of a mass migration of displaced Itzá at the end of the Classic era and/or a migration of lineages (Schele and Grube 1995:16-17).

Migrations back to the Petén heartland may have occurred after the fall of Chich'en Itza (A.D. 948 or 1204) and/or after the fall of Mayapán (A.D. 1450 or 1530) (Ringle et al. 1991; Roys 1962).

Regardless of their migration history, the Itzá were present at Lake Petén Itzá when Cortés traveled through Petén on his way to Honduras (Cortés 1976:219-285). The Itzá territory, centered at Nojpeten, was ruled by the head of the Kan Ek' lineage(s), Ajaw Kan Ek', who claimed genealogical connections to Chich'en Itza (Jones 1998:11). In 1695, AjChan, Kan Ek's nephew, also claimed that his deceased mother was from Chich'en Itza, and "members of the Itzá nobility were still living there in the seventeenth century and successfully avoiding Spanish recognition" (Jones 1998:11). Some evidence exists for this connection through recorded patronyms in the 1584 and 1688 list of married residents: Can (Kan) is most prominent in Hocaba and Sotuta and Ek' commonly occurs in the Cehpech and Cochuah provinces (Roys 1957:Table 1).

The Spaniards described Nojpeten as having multiple temples for worshiping idols and hundreds of houses interspersed with the temples as well as large populations on the surrounding islands and the mainland (Thompson 1951:390-394). It served as the capital of a *multepal* of the Itzá region and the place where the Itzá ruling council lived. Itzá *multepal* rulership was also present at Chich'en Itza as early as the Terminal Classic period. According to Roys (1957, 1962), Tozzer (1941:177), and Lincoln (1994), a group of three brothers or plural rule existed at Chich'en Itza. Lincoln (1994:167) suggests that Itzá kingship may have consisted of up to four divisions of power with each leader/ruler taking a different role such as priest, warrior-based nobility, and royalty. Grube (1994:326) also believes that the Itzá had some sort of dual rulership: "Chich'en Itza has a non-monarchical government...involving more individuals and several sets of companions." In 1697, Ajaw Kan Ek' and K'in Kan Ek' jointly ruled the Itzá territory.

The Itzá territory may have included the archaeological sites of Nixtun Ch'ich', Tayasal, Ixlú, and Tipuj. Rice et al. (1996) believe Nixtun Ch'ich' to be the historical site of Ch'ich' and may have been part of the Kan Ek' or Itzá territory known as the Chak'an Itzá territory. In 1697, K'in Kan Kante and Tut (Noj Che) jointly ruled the Chak'an Itzá. The port area of Ensensada de San Jerónimo was controlled by the inhabitants of Ch'ich', was the passage to the northern Kejach territory, and was the place from which the Spanish attacked the Kan Ek' lineage in 1697 (Jones 1998:Map 4). After the Spanish conquest in 1697, K'in Kan Kante allied with the Kowoj to defeat the Itzá (Jones 1996:6).

Nixtun Ch'ich' has 450 mapped structures (Preclassic to Postclassic in date) and is located on the Candelaria Peninsula in Lake Petén Itzá, south of the Ensenada San Jerónimo and north of the western arm of Lake Petén Itzá (Rice et al. 1996:179). Postclassic architecture is scattered throughout the site. While the majority of Postclassic structures occur on the western side of the peninsula, clusters of Postclassic structures exist near the stone ramp at Ensenada San Jerónimo, along the ditch-wall complex, and on the surface of the fortification wall (Rice et. al 1996:Figure 103). Pottery and other artifacts indicate that the site was occupied from the Middle Preclassic period to the Historic period.

Tayasal is located on the Tayasal peninsula north of Flores in Lake Petén Itzá and was occupied from the Preclassic to the Late Postclassic periods. Postclassic architectural remains occur at the site center and along the periphery of the site.

Guthe (1922) was the first archaeologist to map and excavate distinct areas of Tayasal. He suggested that Tayasal was Nojpeten, but he was unable to locate Postclassic cultural remains that supported his hypothesis. Instead, the excavated material culture yielded Preclassic and Classic period dates. In the 1950s, Cowgill (1963) also investigated Tayasal as well as other archaeological sites along the shores of Petén Itzá and Lake Sacpuy. From his excavations into Postclassic construction fill, Cowgill (1963:84) developed one of the first Postclassic ceramic chronologies that included the ceramic groups of Augustine, Tachís, and Paxcamán. Tachís ceramics were specific to Tayasal and Flores Island and Cowgill (1963:84) dated them to the Middle and Late Postclassic period. Cowgill (1963:127) believed Augustine ceramics to be from the Early Postclassic period and Paxcamán to represent the Middle to Late Postclassic. He concluded that the differences in ceramic frequencies and types at different sites in the Petén lakes region resulted from regional variation and not from changes due to migrations of populations to different areas in the lowlands.

Chase (1983) also excavated several structures at Tayasal and stated that the site lacked an abundance of Postclassic architecture, making the area unlikely as the site of the Itzá capital of Nojpeten. (Remapping of portions of the site in 1996 by Pugh and Schwarz demonstrated the presence of more Postclassic architecture than was recorded by the University of Pennsylvania.) Chase (1985) demonstrated that there was a long population history in the Petén lakes region and that the Paxcamán, Augustine, and Trapeche ceramic groups represented the Postclassic period.

Ixlú is located on the isthmus between Lake Petén Itzá and Lake Salpetén at the extreme west edge of the of the Itzá/Yalain province or in the Kowoj territory. If the site occurs in the Yalain territory, it may be the ethnohistorical site of Chaltunha', and if Ixlú occurs in the Kowoj territory, it may be the site of Sakle'makal. Recent excavations, however, suggest that Postclassic Ixlú was not large enough to be Sakle'makal (D. Rice, personal communication, 2000). Because of the location of Ixlú on the edge of two socio-political group territories, Ixlú may have been a continually disputed site.

Blom first mapped Ixlú in 1924. Morley (Morley 1937-38) also visited the site. In 1968, Bullard excavated two test pits at Ixlú while conducting research at Macanché Island and uncovered Late Classic, Terminal Classic, and Postclassic material culture (P. Rice 1986:266-277). After Bullard's excavation, the CPHEP team mapped the site because Blom's drawing indicated Postclassic occupation (P. Rice 1986:267). In the 1990s, Proyecto Maya-Colonial remapped Ixlú and produced a site map with 150 structures arranged in two large plazas and an elevated acropolis, the majority of which dated to the Postclassic period (Rice et al. 1996:100). Excavations by Bullard in 1968 and Proyecto Maya-Colonial in 1994 and 1999 produced architectural and ceramic evidence that suggested that Ixlú was occupied in the Middle Preclassic, the Late Preclassic, the Late Classic, the Terminal Classic, and the Postclassic periods (Rice et al. 1996:100; P. Rice 1986:266).

Postclassic architecture at Ixlú occurs as three building types: ceremonial groups, plaza groups, and C-shaped structures (D. Rice 1986:328). The ceremonial groups (C-E) are small and surround Postclassic monumental architecture. Large plazas at Ixlú are elevated and occur at positions and angles that are similar to Late Classic buildings buried beneath the Postclassic structures. Structure 2023, a temple in Group A, had two different types of crania caches. At provenience 6d2, a series of 15 crania were placed side by side in two rows facing east. A similar skull row occurs on the mainland of Macanché Island (P. Rice 1986). In addition to the skull row, three caches of two crania occur on an east-west line (corresponding to the last construction of the temple) on opposite sides of a small shrine (Str. 2020). All skulls faced east. Structure 2023 also had red painted stucco. In addition to the architecture, crania caches, and ceramics, Ixlú has two Terminal Classic stelae that date to 10.1.10.0.0 4 Ajaw 13 Kank'in (5 October 859)[1] and 10.2.10.0.0 2 Ajaw 13 Ch'en (24 June 879) and two altars, one of which dates to 10.2.10.0.0 2 Ajaw 13 Ch'en (24 June 879) (Rice 1996b:108, 110).

The Postclassic community of Tipuj flourished between A.D. 900 and A.D. 1525, but was also occupied from the Preclassic to Classic periods (Jones 1989). Tipuj is located on the Macal River in Belize at a cattle ranch known as Negroman. Ethnohistoric and archaeological investigations have been the focus of work at Tipuj. J. Eric S. Thompson (1977) and Jones (1983,1989) have been interested in Tipuj's place in the Maya social and linguistic spheres at the time of Spanish contact. Archaeologically, Kautz and Graham excavated prehistoric and historic architecture from 1980-1987, in field work aimed at locating the ethnohistorically known site of Tipuj. Excavations demonstrate that during the Postclassic periods, Tipuj had an increase in new house platforms that were either newly created or constructed over older archaeological remains (Graham, Jones, and Kautz 1985:209). Although the basic residential construction techniques remained similar to earlier phases, platforms tended to be more elaborate. In

---

[1] Dating of the monuments at Ixlú follows the GMT 584283 correlation method (Gregorian).

addition to new platform construction, the Maya of Tipuj also constructed a new temple type (vaguely similar to Mayapán temple assemblages) and C-shape structures that may have functioned as ritual buildings (D. Rice 1986:328).

Ethnohistorically, Tipuj was a principal center of "anti-Spanish rebellion on the southern frontier" (Jones 1989:12). It was a "frontier" site that served as a location for Spanish missionaries to gather before entering into the Petén heartland. "To the Spanish, Tipuj was a fragile buffer between Christian civilization and the vast Petén pagan heartland" (Jones 1989:14). The 30 non-Christians living at Tipuj at the time of Pérez's 1655 *matrícula* had Itzá compound names that resulted from intermarriage (Jones 1998:54, Table 3.3). Some of the compound names correlate to the Itzá Kan royal lineage. "One of the couples represented a marriage between an AjKan Chi and an IxEk' Mas, each representing a royal name, Kan and Ek', whose combination in certain types of marriage (but not this one) produced the dynasty of Itzá kings known by the double name Kan Ek' . . . . Rather than having been taken to Chunuk'um by the 'Christian' Tipujans, these Itzás were representatives of Nojpeten who had themselves taken the Itzá-colonized population from Tipuj to Chunuk'um, allowing them to be counted there by the Spaniards" (Jones 1998:54-55). (Chunuk'um was a mission town from which Francisco Peréz, the *acalde* of Bacalar, compiled a *matriculá* of people from Tipuj in 1665.) Thus, Tipuj served as a site outside of the Petén lakes region that had a variation of Kowoj architecture and ethnohistorical ties to the Itzá and, therefore, may combine Kowoj and/or Itzá ideology and rulership.

The Kowoj controlled the northern and eastern areas of Lake Petén Itzá and Lake Salpetén. They claimed to have migrated from Mayapán around A.D. 1530 (Jones

1998:18). Spanish Capitán Don Marcos de Abalos y Fuentes (1704) wrote: "The Couohs are almost one and the same with the Itzás because they are located to the north on the shores of their lake. Both are descended from Yucatán, the Itzás from Nixtun Ch'ich' and the Couohs [*sic*] from Tancab [*sic*], ten or twelve leagues from this city. These [the Couohs] retreated at the time of the conquest, the others much earlier." According to Roys (1978:164), Tankah refers to Mayapán, which is 50 kilometers south of Mérida. In addition to Capitán Abalos y Fuentes' comments, Jones (1998:17-18) believes that the migration of the Kowoj from Mayapán resulted from Spanish contact and political turmoil; however, they may have had a series of migrations to and from Mayapán, of which one occurred after the fall of Mayapán at around A.D. 1450 and the last may have been around A.D. 1530 (Rice et al. 1996). The Kowoj relation to Mayapán is strengthened with the linkage of Petén Kowoj kinship patronyms and matronyms to prestigious individuals at Mayapán. For example, Roys (1933:79) noted that in the *Chilam Balam of Chumayel* the name Kowoj was associated with an individual listed as the "guardian of the east gate" at Mayapán.

Although the Kowoj lineage name is rare, the highest frequency of Kowoj matronyms or patronyms outside of the Petén lakes region occurred at Mani, the Xiu capital after the fall of Mayapán (Roys 1957:9, 66). Kowoj, Kab', Kamal, Kawich patronyms occurred in the towns of Tekit, Pencuyut, and Peto in the 16th and 17th centuries in northern Yucatan (Roys 1957:Table 5). In addition to lineage names, Landa (1941:56) and Roys (1957:168) state that the Kowoj lineage powerfully ruled the province of Champoton in the 16th century. Colonnaded open halls, a small temple to Kukulcan (the feathered deity celebrated in Maní after the fall of Mayapán), and a stone wall for fortification at Mayapán resembled those at Champoton (Roys 1957:69, 167). In addition to being at Mayapán, the Kowoj lineage name was found in other Yucatan areas and Belize.

In Petén, Kowoj matronyms and patronyms, such as Kab', Kamal, Kawich, Ketz, and Kowoj, existed in the Petén lakes region during the 17th century (Jones 1998:Table 1.1; Roys 1957:8-9, Table 1). The Kowoj provincial capital located on the northern shore of Lake Petén Itzá, Ketz, was ruled by AjKowoj and Kulut Kowoj (Jones 1998:17, 66). Although Jones assigned this area to the Kowoj, they may not have occupied all of this territory during the Postclassic and Contact period because the Kowoj territory may have come together and broken apart many times during the 17th century.

The Kowoj territory may have included the archaeological sites of Zacpetén, Muralla de Leon, Topoxté, and possibly Ixlú as well as much of the cultivable land on the escarpment of the north shore of Lake Petén Itzá.

Zacpetén is on a peninsula in Lake Salpetén and has a large concentration of Late Postclassic structures, but the site was occupied from the Middle Preclassic to the Historic period with intensive settlement beginning in the Terminal Classic period (Rice et al. 1996:288). The Central Petén Historic Ecological Project (CPHEP) investigated Zacpetén in the early 1980s, produced a map, and conducted preliminary excavations suggesting Postclassic occupation (D. Rice 1986:327). Their excavations and survey also located two stelae (carved and plain) in the northern most group that represents a "Zacpetén variant of Tikal's late Late Classic twin-pyramid complex" (Rice, Rice, Pugh 1997:247).

In 1994, Proyecto Maya Colonial remapped the site and Pugh (1996) began his dissertation research excavations at the site to explain Kowoj ritual architecture and material culture. Pugh's laser transit mapping and excavations more completely demonstrated the presence of three large ceremonial groups, densely clustered domestic structures below the ceremonial groups, a defensive wall composed of a wall-and-ditch construction at the northernmost portion of the peninsula, and an ossuary that contained postcranial skeletal remains of 100 or more individuals (Pugh 1996). Pugh (1995, 1996) believes that the temple assemblages in Groups A and C as well as human effigy censers found in the two groups resemble those found at Mayapán and Topoxté. Also similar to Mayapán, some structures at Zacpetén have painted stucco. Structures 719 and 764 in Group C have red and black painted stucco, Structure 606 in Group A has red painted stucco similar to that on Structure 2023 at Ixlú, and Structure 605 in Group A has fragments of black painted stucco (Pugh, personal communication 2000). Pugh (1996:39) states that the different architecture groups (Groups A and C) may represent two different moieties that conducted similar ritual ceremonies. The same architecture (and rituals) occurs at Mayapán and Topoxté (Pugh, personal communication 2000). Differences in architecture and ritual at Zacpetén accentuate the east-west dichotomy of civic-ceremonial complexes present in the eastern end of the Petén lakes region.

In addition to the five groups of architecture on the peninsula, Pugh excavated two halves of a carved altar and two plain stelae that were built into the southern walls of Structure 606 and one carved stela in the southern wall of Structure 601 (Rice, Rice, and Pugh 1997: 247-249). All are dated to the Terminal Classic period. The carved altar commemorates the birth of a Zacpetén ruler, indicates the lord's mother, his father, and has a possible Tikal emblem glyph that ties the rulers' parents to Tikal (Rice, Rice, and

Pugh 1997:250). The carved stela in Structure 601 shows a figure in profile "scattering" and the glyphs that appear in front of the figure are eroded (Rice, Rice, and Pugh 1997:251). Houston and Stuart suggest that the last glyph may represent the emblem glyph of Sak Petén (Rice, Rice, and Pugh 1997:252).

The Topoxté Islands, Topoxté, Canté, and Paxté, plus two other smaller islands, represent a major Postclassic period settlement that are believed to have produced a technologically distinctive group of pottery: the Topoxté ceramic group. The five islands are located on the south side of Lake Yaxhá in northeastern Petén, Guatemala. The main island, Topoxté Island, has primarily ceremonial architecture and may have been the location of important ceremonial activities in the region (Bullard 1970). The second island, Canté, lacks ceremonial structures and may have functioned as a residential island (Johnson 1985), and the third island, Paxté, has ceremonial and residential structures that suggest that the island served as a residential area for the elite class (Johnson 1985). According to Jones (1998:Map 3) Topoxté may have also been in the Yalain/Itzá territory.

Bullard's (1960, 1970, 1973) excavations at Topoxté defined the Postclassic Isla Phase. His excavations yielded information about the architectural style that demonstrated affinities to the architectural style present at Quintana Roo sites (Bullard 1970:301). In addition to defining the architecture of the Isla phase, Bullard developed an Isla phase ceramic chronology placing Topoxté group ceramics in the Late Postclassic and Augustine and Paxcamán groups in the Terminal Classic and/or Early Postclassic (Bullard 1973:231-241). Bullard (1970:304) believed that the Topoxté ceramic group represented a migration of people from the east coast of Quintana Roo and Mayapán to

Topoxté in the Middle Postclassic, and that the new arrivals into Petén with their "figurine censer cult" were different from the Itzá. With the migration of people came the introduction of a figurine censer cult created exclusively with cream-colored Topoxté Island or mainland clays and slips.

Although Bullard's ceramic chronology is no longer viable, Topoxté is noteworthy in that inhabitants of the site apparently produced Topoxté group pottery and exported it to other sites as far away as Negroman-Tipuj, but the inhabitants of Topoxté did not import pottery from other sites during the Late Postclassic period. "The Topoxté Islands do not share in the other Petén Postclassic ceramic traditions. No Trapeche-group sherds, for example, were found at Topoxté, and no Chilo Unslipped; only one sherd was tentatively classified as Augustine, and only three sherds were identified as being of probable Yucatecan manufacture. The inhabitants of the Topoxté Islands, in short, seem to have sent some of their pottery throughout a relatively broad territory in Petén [and elsewhere], but to have brought in very little in return" (Rice 1987a:159).

Muralla de Leon, located in Lake Macanché, is an island fortified by a wall. Within the wall are 22 structures of which only seven are thought to date to the Postclassic period (Rice and Rice 1981). These structures resemble the temple assemblages found at Mayapán, suggesting that Muralla de Leon may have been part of the Kowoj territory (Rice and Rice 1981:273).

The site has three occupations: the Protoclassic, the Late Classic, and the Postclassic periods (Rice and Rice 1981). CPHEP test pitted eight areas to obtain the dates.

These historical, ethnohistorical, and architectural data suggest that four to six social/ethnic groups lived in the Petén lakes region during the Postclassic period. Ethnohistoric data from Jones (1996,1998) and archaeological data from Rice et al. (1996) suggest that there are differences in social group ancestry and history as well as differences in architectural patterns. Because we also have material culture, such as pottery, collected from excavations at various archaeological sites, it may be possible to reinforce the ethnohistorical data and determine which social group occupied which archaeological site/territory during the Postclassic period.

Because of these potential differences in social group ancestry, I examine the Petén Postclassic slipped pottery in order to suggest which social group(s) made the different pottery. The potter's choices of resources (discussed at length below) may reflect the socio-political milieu in the Petén lakes region during the Postclassic period especially with regard to boundary maintenance and trading relations. Thus, my use of technological styles of Postclassic slipped pottery may be a more sensitive indicator than the pottery types developed in the type-variety system to identify these socio-political differences.

CHAPTER 3

THEORY OF STYLE AND TECHNOLOGICAL STYLE

The concept of style has been employed in anthropological and archaeological analyses and interpretations to make inferences about material culture as well as human behavior. Throughout the various paradigmatic shifts in archaeology (culture-history, processualism, and post-processualism), the concept and emphasis on style has also changed (Hegmon 1992; Plog 1995). Culture-historians use style to form a time line in which changing stylistic features are seen as fossil indices of cultural identity. Processualists see style as able to reveal adaptive cultural systems that render inferences concerning prehistoric social life. Post-processualists use style to describe power relations and see style as a social production. Although there is no general theory concerning style or what style does, the analysis of style in anthropology and archaeology has been one of the main methods by which patterns of material culture have been analyzed and has led to various perspectives in understanding style.

This chapter on stylistic perspectives describes how style was analyzed in the past and is currently being analyzed by anthropologists. I discuss the advantages and disadvantages of the major themes of stylistic analysis and suggest that because of their short-comings, technological style is a more appropriate stylistic analysis for the project because it accounts for design and behavioral characteristics of material culture that may ultimately differentiate social identities.

I. Cultural-Historical Analysis of Style

Culture-historians describe the archaeological record in terms of style because style is employed in the discovery of patterns of material culture (Dunnell 1986). Stylistic similarities from a common origin (homologies) provide chronologies of different phases within archaeological sites or used in seriation of different sites. Thus, style acts similarly to an artifact type (Conkey 1990:8). Because of the archaeologists' dependence on style to build chronologies, specific culture traits define specific culture groups. "The objects as artifacts, and the patterns among and between them, became the immediate subjects of . . . inquiry" (Conkey 1990:8). Material culture is an object of inquiry and basis for knowledge about past cultures.

Brainerd (1942) presented an analysis of four one-dimensional symmetries found on Anasazi pottery from the Monument Valley area, Arizona, and the Maya site of Chich'en Itza in Yucatán, Mexico. Brainerd (1942:165) believed that the patterns on the pottery of the two cultures resulted from conscious and unconscious repetition of preferred cultural norms that came from very different natural settings. Anasazi pottery had twofold rotation designs while multiple symmetries occurred most frequently on Maya Fine Orange pottery. "The predominance of bifold rotational symmetry in Southwestern pottery design suggests that this design did not originate in the attempt to copy living things, since this form of symmetry is not found in plants or animals," but instead related to cultural factors that define the culture, whereas Maya symmetries tended to resemble symmetries present in nature (Brainerd 1942:165). He concluded that the Maya and the Anasazi employ different decorative repertoires that correlate to the level of social complexity and the extent of interregional exchange. These characteristics acted as specific culture traits that distinguish the Anasazi and Maya (Brainerd 1942:165).

Because of the Brainerd's and other culture-historian's dependence on the style of artifacts to build chronologies and act as "fossil indices" denoting a specific culture, they seemed to assume that artifacts took on an autonomous role and culture changes because artifacts changed. Scholars described the archaeological record in terms of style and the definition of artifact types was based on style (Krieger 1944). Dunnell (1986:31) states that the only means by which the archaeological record can be explained and understood results from the examination of homologous similarities that are the result of diffusion, trade, persistence, and migration. Thus, style is important to the culture-historian because of its explanatory value.

II. Processual Analysis of Style

Processual archaeologists, reacting to culture-historians, viewed style in a different manner; they recorded style of functional/adaptational similarity (analogy) rather than place of origin similarity (homology), which leads them to account for the variation in the archaeological record in a different way than do culture-historians (Conkey 1990:8). Material culture is seen as the by-product of behavioral systems; however, the active role of the artifact is not an important characteristic because material culture functions as an adaptive component of a cultural system (Binford 1965). Patterns in the archaeological record are treated as coded information that can be "read" to "tell" about the functioning of past cultural systems. The methodological emphasis changes from establishing chronologies to creating strategies for pattern-recognition because patterns inform the archaeologist about style, context, and the role and functioning of social systems. According to Sackett (1977:372), style is a passive characteristic of material culture that informs the archaeologist about social groupings and/or ethnic boundaries.

Four examples of processual views of style provide the background for the more general theoretical statements provided above: social interaction theory; information exchange theory; emblemic theory; and isochrestic theory.

II.A. The Social Interaction Theory

Proponents of the social interaction theory see style as a by-product of behavioral systems (Deetz 1965; Hill 1970; Longacre 1970; Whallon 1968; among many others). This theory employs stylistic attributes to interpret the degree of interaction between social units. "[T]hese interaction analyses have been used to measure similarity of design element occurrences between two social organization units, . . . the homogeneity of element occurrences within a particular group, . . . and the associations of elements between different styles within or between groups . . . " (Rice 1987b:252). Social interaction theory makes assumptions about characteristics of prehistoric social organization on the basis of stylistic similarity within and/or between sites. The degree of interaction that occurs between social units co-varies with, and is indicated by, the degree of stylistic similarity between them. Styles of material culture from different social groups and/or individuals vary "inversely with physical and social distance," and the "diversity within a region will diminish with increasing intraregional interaction" (Voss and Young 1995:81). Therefore, individuals and groups will produce similar designs as a consequence of the degree to which they interact with other groups.

Longacre (1964, 1970) studied 6,000 pottery sherds from 39 dwelling rooms at the archaeological site of Carter Ranch in Arizona (A.D. 1100-1250) in order to determine if different patterns of behavior or societal rules such as matrilineality were reflected in patterns of artifacts. He tested the hypothesis that pottery designs will be more similar in a matrilineal society than in a patrilineal society. If such "styles" are more similar as in a matrilineal society, it should result in a non-random distribution of artifacts with between-group similarities. As a result of his study, Longacre (1970:47-48) concluded that the homogeneity of design elements present at Carter Ranch is indicative of a matrilineal society. Specific design clusters occurred non-randomly in room blocks associated with kivas. Therefore, each room cluster represented different matrilocal residence groups or lineages that produced internally coherent design element suites with mutual exclusion in the community. The room block data also demonstrates a similar pattern found in burials located adjacent to the village. Two of the three burial groups have design element clusters that resemble those found in the village. The third group contains a mixture of design elements from the other two groups indicating higher status (Longacre 1970:41-45)

Deetz (1965) undertook a stylistic analysis of Arikara pottery from the Medicine Crow site near Fort Thompson, South Dakota in order to determine the relationship between Arikara social structure and pottery decoration before and after cultural disruption. The study focused on three time periods: Component C (A.D. 1690-1720) before European contact; Component B (A.D. 1720-1750) European contact; and Component A (A.D. 1750-1780) after European contact. (Deetz 1965:39). Following Longacre (1964), Deetz (1965:2) hypothesized that:

under a matrilocal rule of residence, reinforced by matrilineal descent, one might well expect a large degree of consistent patterning of design attributes, since the behavior patterns which produce these configurations would be passed from mother to daughters, and preserved by continuous manufacture in the same household. Furthermore, these attribute configurations would have a degree of mutual exclusion in a community, since each group of women would be responsible for a certain set of patterns differing more or less from those held by other similar groups. Change in the social structure might then bring about a change in the nature of ceramic attribute patterning, if this change in any way tended to disrupt the exclusive nature of the shared behavioral patterns existing under a matrilocal residence rule.

In order to test his hypothesis, Deetz recorded surface finish, profile, shoulder-neck angle, lip profile, lip decorative techniques, lip design elements, collar design technique, collar design elements, neck decoration technique, neck design elements, location of decoration, appendages, handle decoration technique, handle design elements, and angle of rim to body of pottery from the Medicine Crow site. After gathering the data, he conducted statistical tests of significance to determine attribute patterns that may correlate to differences in matrilocality. Statistical tests showed that most attribute categories in Component C had low associations with other attributes, Component B marked a trend toward random association of attributes with one another, and Component A demonstrated a continued trend toward random association (Deetz 1965:55-85).

On the basis of ethnohistoric data, Deetz (1965:101) noted that the Arikara's migration into South Dakota was difficult and fraught with problems such as warfare with nomadic tribes and smallpox. As a result, the Arikara social structure, once purely matrilocal, became more generationally based to sustain the changing social environment. Changes in the social environment were reflected in pottery decoration, or lack thereof. Designs varied more than in the past (more random) and this demonstrated a period of great stress and that "rigid matrilocality was no longer practiced" (Deetz 1965:98).

Whallon's (1968) study of Iroquois pottery followed the work of Deetz and Longacre. He examined within-group homogeneity to determine if changes in variability of design elements relate to changes in interaction (1968:227). He assumed that the diffusion of design elements correlated to the nature of interaction. Whallon created lists of vessel morphology, rim types, and other vessel/design attributes from Owasco and Iroquois seriated types. The resulting attributes were calculated as to relative frequencies and coefficients of variability. After statistical manipulation (frequencies and correlation coefficients) of vessel morphologies and rim characteristics, Whallon (1968:234) determined that the increased trend toward stylistic homogeneity through time resulted from a high rate of matrilocality.

Although the social interaction theory is used in many studies, Plog (1978, 1980) and Hodder (1977, 1991) suggest that the degree of social interaction between individuals and groups has no necessary correlation with the amount of stylistic variability. To determine any type of stylistic variability, archaeologists need to examine material culture from more than one archaeological site (Hegmon 1992; Plog 1976, 1978). Many false correlations of group interaction and stylistic variability result from the lack of attention paid to factors of human behavior such as patterns of learning, complex and dynamic descent and residence rules, and archaeological record formation (Hodder 1977:240; Voss and Young 1995). For example, learning can be cross-clan, similar to that of the Hopi, and the final deposition of a vessel does not necessarily indicate its place of use. "Furthermore, style cannot be held to simply mirror social strategies and practices but can also *mediate* and therefore serve to actively reorientate those strategies" (Shanks and Tilley 1987:142). Style is not considered a static, never-changing medium of social interaction; instead, changes are influenced by social processes and social conditions of which the individual participant is involved.

II.B. The Information Exchange Theory of Style

The information exchange theory provides another example of processual use of style as a by-product of behavioral systems (Braun 1985; Hodder 1977, 1978, 1979; Wobst 1977). Stylistic messaging is adaptive because it makes social interaction more predictable and less stressful in exchanges of social and economic entities (Wobst 1977). Style becomes most important when sending messages to socially distant receivers, such as different kin groups or residential units (Wiessner 1983:258; Wobst 1977:327). For example, Wobst (1977:330) demonstrated that the colorful headdresses worn by Yugoslavians sent a social group message to distant kin groups that signified social identity and social group boundaries. Conversely, the utility of stylistic messages decreased when the social distance between sender and receiver decreased. The most efficient mode of stylistic messaging and information exchange with relation to receiving distant social members increased in size and complexity as the message becomes more important. According to Wobst (1977:350), artifacts most likely to be used in a messaging system will be the ones most commonly used and therefore most visible.

Messages reflect and enforce group and individual identity and affiliation, wealth, status, political ideas, and religious beliefs.

Because of the ability of style to convey messages, Wobst (1977:327-328) believed that style functioned in two ways. First, style made social interactions more predictable. This was accomplished through the use of visual information that immediately communicates between the group sending the message and the group receiving the message (e.g., social group headdresses). Social interactions became more predictable reducing stress between the two groups. Second, style reflected complexly organized cultures. As a culture became more complex, styles enhance within-group solidarity by stressing and reinforcing social differentiation and group rank or status.

Hodder (1977, 1979, 1991) examined three social groups in Baringo, Kenya to determine how ethnic boundaries are displayed. He provided information on material culture objects such as dress, drinking cups, maize flour baskets, stools, spears, and shields to support the proposition that material culture of a specific ethnic group functions as a "language" that demonstrated within-group homogeneity (Hodder 1979:447). For example, Hodder (1977:239, 269) stated that although socially distinct groups that communicate with each other share the Tugen-Njemps border, their material culture repertoire is not frequently exchanged. In situations when resources are not critical to the social group, social boundaries will be relaxed and trade with the other social groups occurs more easily. However, when resources are stressed or social conflict arises, people define social boundaries through material culture. Artifacts "symbolize 'belonging' to a group" and become more visible during periods of stress (Hodder 1979:450). The nature of social relations and information exchange becomes cooperative and emulative or competitive and distancing depending on the social milieu.

In addition to between group boundary definition, sub-group boundaries (boundaries within the group such as male/female dichotomies) also occur. Baringo calabashes represent the female social sub-group and mark the area of female control in a male dominated society. Women take great pride in decorating calabashes because calabashes hold cow's milk that symbolizes reproduction and fertility (Hodder 1991:74). The decoration represents women's identity, beauty, and sociability–their characteristics of value (Hodder 1991:82). According to Hodder (1991:89), women who decorate well make a social statement in that they achieve power through the control of children in support of, but also in reaction against, the elders. This type of sub-group boundary definition reinforces the women's political and economic control in Baringo society.

Braun (1983, 1985) believed that stylistic similarities resulted from social proximity, that pottery decorative styles aided in the structuring of social behavior, and that decorative styles were structured by face-to-face interactions. "The longer a set of connections are maintained, the more likely it is that their maintenance will be codified in ritual and symbolic structures" (Braun 1985:131). Social identity is expressed through style and, when social networks change, the individual's social identity also changes due to active choice (Braun 1985:133).

Braun suggested that the Middle to Late Woodland transition (A.D. 200-600) was a time of regionalization and social disintegration that should be reflected in pottery forms and decorative techniques. He demonstrated that within locality and regional decorative diversity (e.g., crescent dentate stamp, ovoid bar stamp, etc.) decreased during the Woodland transition (Braun 1985:130). The change of regional decorative diversity supported the hypothesis of increased supralocal cooperation rather than isolation and disintegration. Braun (1985:137, 147) also established that a decrease in rim thickness of cooking pots by 3-7 cm correlated to an increase in group interaction and communication, a decrease in local and regional diversity, and a decrease in social distance of the five potting communities. Thus, Braun (1985:139) stated that the style of cooking pots and other non-utilitarian pots "should exhibit several abstract properties of constraint relating to the structure of the symbolic code–highly redundant system of coding of the social messages, the transmission of invariant messages by invariant, conventional codes, the transmission of diacritical information by diacritical codes and gradational information by gradational/continuous codes, and the existence of a meta-code or syntactical structure common to each pair of communicating parties."

Again, the information exchange theory assumes that material culture passively transmits identity. Instead, style can be active in the transmission of complex and ambiguous information in order to establish and maintain social relations, and who creates style in order to transmit a message also needs to be considered (Hegmon 1992: 20, 22). The information exchange theorists often assume that style functions only in large social groups located at great distances from each other, and that material culture contains highly visible symbols (Voss and Young 1995:81). However, style can reflect personal identity at a smaller scale in order to establish a positive self image (Wiessner 1983:56). Style can also be an important part of a vessel that is not overtly displayed. For example, sacred decorated pottery carries a message, but it is often confined in a house (Sterner 1989). In this case, the "message" is in the content and use of the vessel by the domestic unit rather than a larger audience. Finally, the theory of information exchange employs different styles that may have broad meanings and could signify any number of messages to one or many groups (Hegmon 1992:20).

II.C. Wiessner's Emblemic and Assertive Styles

A third processual approach to style is emblemic or assertive style (Wiessner 1983, 1985). In Wiessner's discussion of style, she combined the social interaction theory and information exchange theory of style in order to examine "intragroup and intergroup relations that correspond to stylistic variation" (Wiessner 1983:253). Style functions to transmit information about personal and social identity and has a behavioral root in the process of personal and social identification in relation to others. Group and individual identity are transmitted through the population (emblemic) and the individual (assertive). Emblemic style is "formal variation in material culture that has a distinct referent and transmits a clear message to a defined target population about conscious affiliation identity," while assertive style is "formal variation in material culture which is personally based and which carries information supporting identity by separating persons from similar others as well as by giving personal translations of membership in various groups" (Wiessner 1983:257).

Because style is transmitted in both ways (emblemic and assertive), it is created through social comparison with other cultures to ensure social recognition and positive self-image (Wiessner 1985:161). Transmitted style carries information about boundaries, rates of interaction, nature of personal and social relationships, and social identity through time and one cannot predict where it will reside (Wiessner 1985:163). Style can also index types of social organization.

For example, Wiessner (1983) showed through projectile point styles that the San of the Kalahari have an egalitarian society based on risk-sharing strategies and a lack of personal ownership and stylistic homogeneity. She demonstrated that individuals could not distinguish their own projectile points, but that they could identify their language groups' projectile points from other language groups' projectile points because of the differences in tip width and body shape. Wiessner (1983:269) stated that the San believe that "if a man makes arrows in the same way, one could be fairly sure that he shares similar values around hunting, land rights, and general conduct." Therefore, San arrows, and presumably other types of material culture, are loaded with social and political implications (Wiessner 1983:261).

The ability to distinguish a culture group's material culture reflects assertive and agent based aspects of style because the formal variation in the projectile points manufactured by a specific language group defines identity characteristics by translating artifact patterns to group membership (Wiessner 1983:258). From this study, Wiessner (1985:164) concluded that emblemic and assertive styles contain information about "1) the existence of groups and boundaries, 2) rates of interaction, 3) the nature of personal and social relationships, and 4) the balance between expression of personal and social identity through time." Variation exists where stress occurs and boundaries intersect and provides a means by which to define "us" and "them."

Although Wiessner (1983) was able to demonstrate that projectile points reflect style at the level of the language group in San society, her emblemic and assertive styles have "no distinct referent" (Wiessner 1983:258). In addition to the lack of a referential base, emblemic and assertive styles are narrowly stylistic and do not reflect the San technological realm of society which needs to be considered when dealing with material culture (Sackett 1985). Finally, Wiessner is not able to determine the mechanisms by which styles change through time.

II.D. Sackett's Isochrestic Style

The fourth example of processual archaeologists' views on style is Sackett's isochrestic variation in which "there exists a spectrum of equivalent alternatives, of equally viable options, for attaining any given end in manufacturing and/or using material culture" (Sackett 1990:33). For Sackett (1982:72-73), there are four steps by which style and function relate: "1) although the style that the archaeologist views on an object of material culture 'may be appropriate to its function,' multiple alternatives exist; 2) artisans choose a specific way of doing something from the options in statement one; 3) chance dictates which alternative is chosen and that it is unlikely that two ethnically distinct cultures will choose the same option; and 4) a strong correlation exists among artifacts in a culture because of socially transmitted learning."

Sackett (1986:68) stated that isochrestic style resides in the formal variation "that is supplementary to, added on, or adjunct to the utilitarian functional form of an object" and this style reflects a "latent quality that at least potentially resides in all formal variation that is one way or another passed through a culture's matrix." In Sackett's isochrestic style, function and style are complementary and both result in stylistic variation (1982:68). Thus, style represents socially bounded choices that have specific meanings and are consistently expressed at a specific time and place due to social interaction. Styles express ethnicity because they are bound to culture and learned behavior and because ethnically distinct groups choose different styles to enhance their social interaction by expressing differences through the style and function of an object (Sackett 1982:72-73). Function resides in the form of the object as well as in the style of the specific context and choice of different designs, and style is not restricted to design alone (Sackett 1982:75).

To develop his concept of isochrestic style, Sackett (1966) examined Upper Paleolithic end scrappers. Sackett measured and coded front contour, front contour modifiers, front height, width, black class, body contour, and marginal retouch to determine statistically significant clusters of end scrapper attributes. Through statistical testing, a number of end scrapper attributes, such as front contour, piece width, and marginal retouch, cluster to form statistically significant groups that correlate to different seriations of Vezere Valley sites (Sackett 1966:378-387). The clusters of attributes represent choices of technology made by the manufacturers and the choices are variable and present regionally and subregionally. "A morphological feature such as marginal retouch may have served functionally either as an auxiliary cutting edge or as a means for shaping the front portion of end-scrapers, but at the same time its frequency of occurrence and mode of execution may have been subject to stylistic dictates" (Sackett 1966:389-390). In either case, the basic premise of an isochrestic style, a choice of function and style selected by a social group from an infinite number of possibilities that is dissimilar to other social group styles, is upheld.

Although Sackett attempts to discuss style in terms of stylistic features (design), functional features (form), and choices that are attributable to the definition of style, his use of style is passive and "dictated largely by the craft traditions within which the artisans have been enculturated as members of social groups" (Sackett 1985:157). He states that the three attributes of stylistic variation coincide with and reflect one another, but he does not make the connection that style and form or style and technology continuously define each other (Lechtman 1977; Lemonnier 1992).

III. Post-Processualists Analysis of Style

In opposition to the cultural historical and processual theories of style, post-processualists view material culture as an active constituent element of social practice and a social product. Material culture exhibits stylistic features formed through "social conditions" and "social constraints" that play an active role in relation to the human manufacturer of the artifact. "The artist is a material agent acting in a particular time and place under social conditions and constraints s/he has not created, and located in relation to social contradictions which, by definition, cannot be individually controlled" (Shanks and Tilley 1987:148). The individual becomes a cultural producer rather than a creator who created from divine inspiration. Production and manufacturing takes place in a social community that is structured by economic, political, material, and ideological relationships. Thus, material culture displays the ideology of a social group.

Post-processualists explain style in relation to the social reality (power and social strategies) inherent in the culture when an artifact is created. To understand the different forms of social reality, the researcher conducts a type of analysis that relates "to within and between-group social relations and the manner in which other aspects of material culture, in various social contexts, are produced and structured" (Shanks and Tilley 1987:152). This type of structural analysis can be seen in three works: Hodder (1982), Adams (1973), and Arnold (1983). (Although Adams and Arnold are not post-processual archaeologists, these two works employ structural theory in a similar manner as other post-processual archaeologists.)

Hodder's ethnoarchaeological example of the Mesakin Nuba of Sudan demonstrates that social structures underlie disparate attributes of material culture-patterning. The patterning relates to a common social element, such as the position of a hearth in a housing compound, that promotes group boundedness and purity (Hodder 1982:125-184). "Individuals organise their experience according to a set of rules. Communication and understanding of the world result from the use of a common language–that is, a set of rules which identify both the way symbols should be organised into sets, and the meaning of individual symbols in contrast to others. Material culture can be examined as a structured set of differences" (Hodder 1995:104). Decorated calabashes represent one such set of material culture. The structural opposition of clean/dirty, male/female, and the like appears in the Mesakin Nuba social structure and on decorated calabashes. Hodder (1982) described the decoration that appears on calabash as a structural grammar derived from a cross and arrow motif. The design motif organized in many different manners and dictated by specific rules is found on calabashes. Designs similar to those found on calabashes (the female domain and one-half of the structural dichotomy) are also linked to reproduction, witchcraft, liaisons with young unmarried men, and female circumcision–all characteristics of the dirty, female half of the Mesakin Nuba dichotomy. Consequently, these designs exert female control over the rules of purity, boundedness, and categorization (Hodder 1982).

Adams (1973) showed that the form and nature of social relations of the

Sumbanese of Indonesia structure the production and manufacture of textiles and their designs, the spatial organization of village settlement plans, and the small-scale society marriage alliances. These principles of social interaction also occur in the production of textile designs that transform social ordering. Men's ceremonial wraps, *hinggi*, have mirror reflection designs– the same design occurs twice on the textile (Adams 1973:267). "Each cloth consists of two identical panels, left and right. Further, from the exact center the upper and lower parts form mirror image halves. Finally, within the bands, individual designs appear either simply repeated or in mirrored sets of confronted or addorsed (back-to-back) pairs" (Adams 1973:271-272).

In addition to the mirror image of textile styles, the community's relation to the cosmological world, the seating arrangements of formal negotiations, the meetings to exchange goods, and the movement of brides in the marriage system also reflect mirror images. Sumbanese also divide ceremonial textiles into stratigraphic bands (Adams 1973:274). The large band, *hei*, is surrounded by subordinate rows and the center of the cloth is considered sacred and the most significant. The Sumbanese capital village is arranged in the same manner–the rulers' house is in the center surrounded by eight clan houses (Adams 1973:274). Adams concluded that the design of the textiles recreates the social structure of Sumbanese society.

This same structuring principal can also be seen in Arnold's (1983) ceramic study of Quinua, Peru. He related the design elements of pottery produced and used in the village to aspects of social patterning within the community and to the community's perception of its own environment. Arnold (1983) demonstrated that horizontal and vertical spatial orientation of community patterns corresponds to the decorative space on

Quinua pottery. For example, land and social structures are separated: the savannah area is divided into two *barrios* based on an irrigation system, geography of Quinua is divided into ecological zones, individuals are divided into two descent groups, and there are two social classes in the village. Pottery vessel design areas correspond to social and geographical features. Vessels have horizontal divisions with bilateral symmetry of motifs that are separated by a series of horizontal bands. The bilateral symmetry on the vessel demonstrates vertical reflection. Taken together, bilateral symmetry and vertical reflection are dominant characteristics of pottery decoration and social structure because human thought categories transcend social structured categories.

Similarly, when undertaking such studies, the post-processual researcher pays particular attention to combinations of elements, their arrangement in space, and the ways in which the design may be transformed into a type of grammar (Muller 1979; Washburn and Crow 1988). This grammar, like a sentence, is structured in such a way that one part (a verb) occupies a specific place in the design (in a sentence) and requires other elements (e.g., nouns with different functions) in a context for meaning. Thus, the structure of words in a sentence give the words meaning. In a similar manner, it may be possible to see the structuring and restructuring of social reality in various cultures through the arrangement of design elements on pottery as demonstrated above.

Finally, style for the post-processualist also exhibits a form of social practice; the individual is under the influence of a social whole (rather than individual practice). Because artists are part of a larger social group, they are influenced by social constraints and group ideologies that may not be under the control of the individual. Ideas are also structured and systematic and not under the independent control of the individual. "The relative uniformity of ideas in any given society rests on a successful claim to the universality and naturalness of what is, in fact, a partial perspective structured by those in positions of authority who possess the power to define what is real" (Shanks and Tilley 1987:149). Style reflects a structured signifying system that displays the ways in which people think about and react to social reality because it maintains existing systems of power and ideology.

Leone's (1988) discussion of Annapolis gardens and the Georgian Order demonstrates the post-processual concept that the larger social whole influences style. Creators of the 18th century gardens in Annapolis, such as William Paca, observed rules for the creation of social style in three dimensional space through the use of terraces, converging and diverging lines, and other gardening features (Leone 1988:250-252). By observing the rules of social practice, homeowners displayed their ability to observe and conquer nature and thus place themselves in the Georgian social order that was the base of wealth, capitalism, and power. "[T]he implications of these homes and landscapes were to convince people that a rational social order based on nature was possible and that those with such access to its laws were its natural leaders" (Leone 1988:250). Thus, the ability to copy nature through a set of rules, allowed the *nouveau riche* of Annapolis to establish their social and political security through conforming to the style dictated by the 18th century social order.

Style, because it reflects ideological views, may be manipulated in relation to between-group and within-group social strategies. Because of this phenomenon, the post-processual researcher observes the relationship between the material culture and the social group and how the social group relates to the object of material culture. Thus, style is a form of social practice studied in relation to habituating forms of social consciousness, restructuring social reality, and inserting ideology.

Although post-processual theories concerning style demonstrate the various effects (social and ideological) of representing and misrepresenting methods of domination and influence that may be apparent in the archaeological record, some aspects of style are not considered. First, style is divorced from the individual because the individual is only a mirror reflection of society leaving no room for innovation or experimentation. Second, behavioral and material choices in the manufacture of artifacts and creation of style are not addressed. Finally, post-processual theories deny style an active role in social identification--style merely reflects the ideology and social reality of a culture.

IV. Technological Style

Given the different approaches to style in material culture, none are sufficient in and of themselves to differentiate social identity based on technological/behavioral and stylistic attributes because none of the approaches conjoin technology and surface decoration to define a style. The one "theory" of style that accounts for the technological and stylistic characteristics of style is that of technological style (Lechtman 1977, 1979, 1981, 1984a, 1984b, 1988, 1993, 1994; Lemonnier 1986, 1989, 1992, 1993; Stark 1998; Wright 1985). In general, technological style allows one to discuss how the technology of the creation of a piece of material culture informs and creates a style, and how the created style may be defined through the technological characteristics of the object of material culture. "Technology" is defined here as the sequence of manufacturing choices that involve matter, energy, tools, motor patterns, and specific knowledge (Lemonnier 1992:5-6). "Style" refers to the "visual representations, specific to particular contexts of time and place, that ... transmit information about the identity of the society that produced the style and about the situation or location where it appears" (Rice 1987b:244). Through the examination of technology and style, one can establish the underlying similarities of formal arrangements of technological and stylistic patterns that represent and/or display social identities.

Lechtman (1977:4), the major proponent of technological style, describes technological style as the relationship of design elements and the patterns that people produce through various acts of behavior that distinguish the style of a particular category of material culture. The decorative aspects of design, whether a simple color or intricate combinations of design elements, are a product and aspect of the behavior of the producers of that object. One way to interpret the behavior of a producer is through the technological choices that s/he makes when creating material culture. The operations, material, and labor (technological activities) define the technological aspect of style. It is the combination of choices "defined by these relationships that is stylistic in nature" (Lechtman 1977:6). Thus, the integration of behavioral events at each level of manufacture defines technological style and technological style is "recognizable by virtue of its repetition which allows us to see the underlying similarities in the formal arrangements of the patterns of [manufacturing] events" (Lechtman 1977:7).

Technological style relies on choice in technology and style. When producing material objects, the producer may have many choices (operational sequence) to make that concern 1) matter (e.g., clay), 2) energy (e.g., the forces that move and transform matter), 3) objects (e.g., tools), 4) gestures (e.g., the movement of tools involved in a technological action), and 5) specific knowledge (e.g., the "know-how" that is a result of all possibilities and choices for technological action or social representations) (Lemonnier 1992: 5-6). These choices reflect sociological and cultural constructs that underlie and direct the producer's actions, and subtle differences in any one of the five choice realms listed above can influence the social representation of material culture and "the symbolic aspect of social life" (Lemonnier 1992:23, 1993:4, 9). Although Sackett does not propose technological style as a valid way to analyze style, he does state that the technology of a material cultural product is important in understanding its style and the possible cultural message(s) that is/are being sent. "Nonetheless, the instrumental form that is built in, rather than added on, to the pot is also a great reservoir of style. For the pot's manufacture and the utilitarian ends it was designed to serve required its maker to choose . . . among a considerable variety of . . . alternatives with respect to clays, tempers, shapes, thicknesses, and techniques of construction and firing, some or possibly even all of which can be just as ethnically--and hence stylistically--significant as the decoration that may be applied to its surface" (Sackett 1990:33).

Gosselian (1992), Steinberg (1977), and Childs and Killick (1993) provide three examples of how different aspects of the operational sequences are reflected in the material record. Gosselian (1992) demonstrates that the operational sequence is a learned process and thus the production of an object of material culture is dependent on a cultural framework. The Bagia of Cameroon make daily choices in the production of pottery, specifically in the shaping of the vessel (steps 2 and 4 above) that resemble those of food production, procurement, and preservation (Gosselain 1992:578, 583). Thus, the operational sequence and the choices that the Bafia make demonstrate the producers knowledge of production that permeates many aspects of cultural life, her/his social and natural environment, and ultimately ethnic identity.

Steinberg (1977) examined the operational sequence (techniques of procurement, choice of material for the object, and the process of working material) of Shang China (1600-1027 B.C.) and Iron Age Anatolia bronze casting. The process of creating bronze objects is a "complex translation of ceramics and other materials into metal" (Steinberg 1977:61). Shang China bronzes are made from ceramic molds and Anatolia bronzes are created by hammer smoothing that is also employed in pottery production. Both manners of bronze creation represent technological styles based in other realms of material culture in such a way that "reasons for certain forms are to be found in other aspects of each culture, especially in the standards of appreciation, the general level of skill, adaptation to environment, subsistence, religion, and trade" (Steinberg 1977:79).

Childs and Killick (1993) present an example of how the knowledge of the production of a technological style can place members of a society in highly respected positions. The Mafa of Northern Cameroon, the Bantu speakers, and the Ushi of Zambia revere their metallurgical producers because they are thought to have the specific ideological knowledge necessary to create objects reflecting social status and enhance the symbols of power and prestige. Transforming ore to metal is analogous to gestation, birth, fertility, and productivity (Childs and Killick 1993:331). Because the metallurgists are able to transform ores, producers have similar rights as kings (Childs and Killick 1993:328). Producers are also highly regarded because the location where they transform ore to metal is near the place of the ancestors (Childs and Killick 1993:328). Thus, metallurgists have a connection to ancestors because of their specialized knowledge of a specific technological style.

The material and the process of manufacture contribute to an object's style as much as the surface decoration because technological acts are also embedded in a symbolic system that reflects social reality and indigenous knowledge that is "translated by, among other things, implicit or explicit classification of the materials treated, of the processes brought into play, of the means and tools employed, and of the results obtained, without speaking of the presentation of the actor's roles" (Lemonnier 1986: 160). Thus, style is a technological performance of social production and mental schemas that need not carry directly observable meaning and can be learned and transmitted from generation to generation (Lechtman 1977:6, 1993; Lemonnier 1993:3).

By combining the choices available from the technological and stylistic realms, one can better understand "emic behavior based upon primarily etic phenomena of nature" (Lechtman 1977:7). This type of analysis is possible because the social representations behind the technological style presented on material culture are the perspective of the producer toward the raw materials that are used, "the attitudes of cultural communities towards the nature of the technological events themselves," and the attitudes of the community towards the end product (Lechtman 1977:10, 1988:369). However, to fully understand the technological and stylistic realms, one must conduct a synchronic and diachronic analysis of the design elements and the transformation and social representations that permeate beyond the material world (Lemonnier 1992:3).

As a result of this type of analysis, one understands that the essence of the object is as important as the surface stylistic message being sent and received by members of the same community or by members of different communities. The physical characteristics of an object are important, but how the object is made and used also reflects the relationship between social representations and the physical world (Lemonnier 1992:36). Therefore, beliefs and attitudes toward the materials of manufacture are supported through the technological process of production where the external appearance of an object depends upon the internal condition of the object (Lechtman 1979:33).

The Chavín and Chimú Andean cultures illustrate the importance of the essence of an object with the use of *tumbaga* objects to signify wealth and political power. *Tumbaga* is a copper-gold alloy created by dissolving gold in an aqueous solution in order to replace gold ions with copper ions. The metal is hammered to bring the gold ions to the surface (Lechtman 1984b:59). The resulting metal has an outward appearance of gold, and it may have been assumed that the inside of the object is also made of gold. In actuality, the *tumbaga* alloy only has minute fractions of gold on the interior of the object. The idea that the *tumbaga* object is solid gold was important because the color of gold reflects social beliefs of wealth and political power, reinforcing the power of the religious cult and separating the secular and religious spheres of society (Lechtman 1979:32, 1984a:9). Gold also symbolizes the sweat of the sun which is an important element of Inca origin myths and the royal family claimed ancestry from the sun (Lechtman 1984a:14; 1984b:63). Therefore, essential qualities that reflect social relations (the color gold equating power of the elite class) on the outside of an object must also be thought to be inside of the object for that object to have the underlying social qualities associated with its external appearance. The *tumbaga* tradition was perpetuated because the artisans approved the material and the nature of the technology and the culture approved the essence of the final product (Lechtman 1984a:30).

Technological styles and their associated technical processes tend to appear in suites of material culture. Lechtman extends her discussion of the creation of *tumbaga* to describe how similar developments in other classes of material culture such as cloth occur with similar social representations. Decorated cloth reflects ritual significance, wealth, and power because of its structural and superstructural design–what is in the inside and apparent on the outside (Lechtman 1984:31-33). The structural design consists of the warp and weft of the yarn. The manipulation of the fundamental building blocks of cloth results in weaving of the cloth and to remove any part of the base of the "style" would destroy the object. The second element of the technological style of cloth is the superstructural mode or the added design. Embroidered patterns appear on the surface of the cloth and are easily seen. However, if the underlying structure does not exist, the "style" of the cloth cannot be present and the cloth lacks any power or social status meaning because the cultural message is "embodied in and expressed by structure" (Lechtman 1984a:33-35; 1988:375). Structural and superstructural characteristics of cloth result in a symbolic reality that cannot be separated from its sociocultural context. Cloth and *tumbaga* objects display "the working tradition [that] was joined with a tradition focused on surfaces, emphasizing the ...surface as the carrier of information or the seat of visual communication" (Lechtman 1988:371). It is through the technological performances and social interaction that styles become symbols "through which communication occurs" (Lechtman 1977:13).

Different technological styles may be developed and operate synchronically, but they will not be perpetuated unless the technological style is compatible "with the natural environment and with the state of technological systems at the time of creation" (Lemonnier 1993:12). Because "choices are arbitrary from a technological point of view," technological styles are a result of accommodation rather than a result of alteration. As such, the new style has to fit into an already existing structure of social meaning and practices and the object needs to be able to be interpretable by those within the social group and by those from "competing" social groups to be perpetuated in a culture (Lemonnier 1992:18, 1993:14). As a result of a new technology having to fit into an already existing system, some choices will impinge on the transformation of technological systems. A technology also may not appear in society because it is not "in fashion" or does not look like something that already exists (Lemonnier 1989:166). If this happens, some innovations will not be reproduced and will never be seen by the cultural group at large because selective pressures at the individual and community levels always exist that decide what will represent social structures such as power, ancestry, and identity (Lemonnier 1993:15). On the other hand, it is possible to have many different stylistic schema representing the same social group because there is "no necessary or unique correspondence between the expression of a socially defined technical aim and the physical objects and actions that a given culture use to perform its function" (Lemonnier 1993:16). Therefore, the resulting technological style is the "source of precise information about the history of its own manufacture" (Lechtman 1994:5).

When conducting research on technological style, there are three levels of technological style systems that provide information on social representations of identity: 1) the operational sequence; 2) the interrelationship between artifact classes, raw materials, and techniques of formation; and 3) the relations between the technological style and social phenomena (Lemonnier 1992:10). These three characteristics of technological systems identify which styles may reflect social identity because it is the variations in the three characteristics that indicate differences in social relations. The operational sequence reflects choices that are embedded in the social structure and may be totally unconscious mental operations such as smoothing a pot (Lemonnier 1992:80). The interrelationship between artifact classes, raw materials, and techniques of formation suggests that techniques of manufacture may have been borrowed from other artifact classes and it demonstrates choices made during the manufacturing process. By examining other classes of artifacts and their "styles in which technology developed and gained physical expression" one observes the connections "with other cultural patterns and those patterns and the links among them can be looked for either in the artifacts produced by other technologies within the culture or perhaps in other cultural subsystems..." (Lechtman 1979:33). The relations between technological styles and social phenomenon reflect the organizing principles behind the diversity and arbitrariness of the technological choices that "relate structural features of technological systems to other social relations" (Lemonnier 1992:97). It is important to go beyond the materials from which an object of material culture was made and to examine the context and manner in which it was made and used. The social representation of technology encompasses the "representations of physical components and aspects of material culture, and not just representations underlying features of shape or decorations that immediately communicate something to people able to read them–certainly play a crucial role as a mediator between forces of production and social relations of production" (Lemonnier 1992:100). Different technological styles may represent different "mental processes that underlay and direct our actions on the material world [and] are embedded in a broader, symbolic system" (Lemonnier 1993:3). For example, ritual or sacred objects may have a different technological style than utilitarian objects because the "message" may not be the same (Lechtman 1977:16). Thus, the choice of a technological framework involves the definition of a social dimension of society because the anthropologist needs to relate structural features of technological systems to other social relations and other classes of material culture in order to develop a broader anthropological meaning of technology and style.

Because this project examines Petén Postclassic slipped pottery groups in order to identify technological styles and determine which social group created which technological style as a way to mediate social relations and differences in identity, Lechtman's technological style seems to be the most logical operational framework in which to proceed. Through the theory of technological style discussed above, I analyze the technological styles for this pottery to suggest that: 1) technological and stylistic choices have a social context; 2) technology and style are social reproductions of Postclassic society; 3) some technological and stylistic choices were more compatible than others with Postclassic Maya society; 4) technology affects style; and 5) these compatible choices reinforced the existing technology and social ideology and social identity. To demonstrate these aspects of technological style, I examine the similarities and differences in particular technological and stylistic traits through time and over space to determine if the similarities and discontinuities are related to social identity. I am able to do this type of analysis on Postclassic slipped pottery because "subtle social relationships through a society's social representations of technology influence the physical action of the material world" (Lemonnier 1992:23). Thus, through analysis of the Mayas' choices of technologies and styles, it may be possible to determine the extent to which social representations are reflected in the development and performance of technological and stylistic action in order to define social identity and ethnic boundaries.

CHAPTER 4

SAMPLING AND METHODS

Because the focus of the study is to determine the possibility that social groups in the Petén lakes region produced distinctive technological styles of pottery that displayed identity, I first chose sherds that were slipped and decorated. Without a decorative sample, I could not complete an analysis that compared the relationship of decorative elements, technological characteristics, and the patterns that people produce through various acts of behavior that distinguish the style of a pottery. However, not all sites included in this study had adequate numbers of decorated Postclassic slipped pottery in all pottery types and varieties. As a result, I selected monochrome slipped types to fulfill the stratified random sample of pottery.

Fifty sherds from each ceramic group at Ch'ich', Ixlú, Zacpetén, and Tipuj were chosen through a stratified random sampling methodology. Although all sherds should be available for selection, because of the type of analysis being conducted, six restrictions were placed on the sherds in order to qualify for the selection process (Rice 1987b:321-324). First, only sherds that were larger than 2.5 cm were considered for selection. Size restrictions were necessary because of the destructive methods of analysis described below. As a result of this requirement, not all excavated buildings from the four sites are represented in the study. Second, I selected only sherds representing different vessels in order to avoid over sampling one vessel at the expense of others. To ensure that different vessels were sampled, all sherds were reconstructed as completely as possible. Third, slipped and decorated surfaces had to be in good condition and not overly eroded in order to conduct a full technological style study. Fourth, unprovenienced sherds were not selected. In order to compare technological styles, I had to ensure that I analyzed the same time period. Fifth, rim sherds were selected first because of their potential for defining technological styles through form. Finally, no sherds that represented more than one-third of a vessel could be selected because the Guatemalan government restricted their export.

Stratified random sampling was the best method by which to obtain a sample for this study because Postclassic slipped pottery represents a heterogeneous collection with multiple subpopulations or types and varieties (Sinopoli 1991:48). The sampling methodology also enhanced statistical precision so that "the variability of the sampling distributions of whatever statistics are involved in the research will be decreased" (Hinkle, Wiersma, and Jurs 1994:161). I determined the number of types and varieties of decorated pottery present in each ceramic group, and selected a proportional allocation. In cases where 50 decorated sherds were not available from each ceramic group at each archaeological site, I selected monochrome slipped sherds by stratified random sampling.

Paxcamán and Topoxté ceramic group sherds were sampled in the same manner for each of the four sites. First, I placed all decorated sherds from one site on a table grouped according to the identification number of the structure from which they were recovered. Second, I ascertained the number of pottery types and varieties represented at each structure. The number of sherds per type and variety and structure determined the number to be randomly selected and the number varied depending on the structure, so that buildings with more decorated types were sampled more often. Third, I wrote each lot number of each sherd on a piece of paper and placed the papers in a container according to the structure and type and variety. The predetermined number of sherds to be selected for each structure determined how many lot numbers were drawn for inclusion in the sample. This selection process continued for all sites that had Paxcamán and Topoxté ceramic groups, each type and variety, and each structure. Ixlú did not have 50 Topoxté sherds from which to select, so I chose half the sherds in the pottery collection. Ch'ich' had no Topoxté sherds and was thus not included in the selection process.

Trapeche, Fulano, and Augustine monochrome slipped sherds were selected in the same manner as described above for the first three steps. However, first, all decorated sherds were selected because of their rarity. Because Trapeche and Fulano sherds were rare at Ixlú and Ch'ich', a total sample of less than 50 sherds resulted. The Trapeche ceramic group is not represented at Tipuj.

The above selection resulted in 551 sherds for analysis.

In order to identify the existence of patterns defining Petén Postclassic technological styles, several types of analysis were conducted to obtain technological and stylistic information: type-variety analysis; "low-technical" analyses; petrographic analysis; x-ray diffraction analysis (XRD); scanning electron microscopy (SEM); energy dispersive x-ray spectroscopy (EDS); and strong acid-extraction ICPS analysis. Table 2 presents the type of information that can be obtained from each type of analysis and how the techniques compare. Postclassic slipped pottery groups from the sites of Ch'ich', Ixlú, Zacpetén, and Tipuj are used to gather technological and stylistic data that could differentiate Postclassic slipped pottery technological styles. These base patterns discerned through analysis of pottery from these four sites were then applied to the Postclassic pottery collections from the sites of Tayasal, Macanché Island, and Topoxté, which were only visually examined because the collections are housed at other locations. The objective of this application is to "test" whether these styles can be identified in the material from other Postclassic sites in the region.

I collected type-variety, pre- and post-fire hardness measurements, pre- and post-fire color measurements, decorative manner and techniques, form measurements, and binocular microscope mineralogical data information for all sherds. From these data, I selected a sub-sample for petrographic analysis, x-ray diffraction, SEM and EDS analysis, and strong acid-extraction ICPS analysis. A proportional stratified random sample of sherds (as described above for the initial selection of sherds) from each ceramic group was selected for petrographic analysis. Selection procedures ensured that all types and varieties were included in the petrographic sample and the sample included a range of mineralogical information obtained through binocular microscopy. I chose a proportional number of sherds for ICPS analysis from each ceramic group and each site for a total of 100 samples. All types and varieties were included to ensure a range of data. The same 100 samples were used for EDS analysis. I collected SEM data on 24 sherds that represented the different groups of elemental concentrations as obtained

Table 2: Comparability of Methodologies

Methods of Analysis	Inferences			
	Behavior Choices	Physical Properties	Mineral Identification	Chemical Identification
Type-Variety	X	X	X	
"Low Tech"	X	X		
Petrographic	X		X	
XRD	X	X	X	
SEM and EDS	X	X	X	X
Acid-extraction ICPS	X	X		X

through EDS analysis. Eighteen XRD samples were chosen because their estimated firing temperatures were below 400°C and the clay structure had yet to collapse. I had originally planned to conduct x-ray diffraction data on a 100-sherd sample, but because of the higher than expected firing temperatures of the sherds, this was not possible.

I. Type-Variety Analysis and Establishment of a Regional Ceramic Complex

The first level of analysis to be conducted in this research program consists of morphological and typological analyses based on the type-variety classificatory system. This binomial nomenclature system, created by archaeologists, was developed in order to facilitate comparisons of pottery from different sites (Gifford 1960, 1976; Sabloff and Smith 1969; Smith, Willey and Gifford 1960; Wheat, Gifford and Wasley 1958). Ceramic analyses that utilize this system of classification employ a standardized set of levels of classification to name and hierarchically group categories of archaeological pottery.

Type-variety classification relies on the premise that attributes exist at different distinguishable levels of devised classifications that can be hierarchically nested. Four hierarchical units of analysis comprise the type-variety system: ware, group, type, and variety (Gifford 1976; Smith, Willey, Gifford 1960). The ceramic sphere and complex have been added as integrative units of classification. Ceramic spheres consist of two or more ceramic complexes that share a majority of the most common types (Willey, Culbert, and Adams 1967:306-314). Postclassic ceramic spheres in the southern Maya lowlands include the Isla ceramic sphere, the New Town ceramic sphere, and the Boca ceramic sphere. Complexes are defined as the sum of modes and varieties that comprise the full ceramic content of a particular site in time and space (Ball 1976:324). Southern lowland Maya Postclassic ceramic complexes include the Aura complex, the Dos Lagos complex, the Ayer complex, the New Town complex, and the Bayal complex. Wares represent paste and surface characteristics that indicate gross technological and manufacturing similarities (Rice 1976:539). Clemencia Cream ware, Vitzil Orange-Red ware, and Volador Dull-Slipped ware are examples of Petén Postclassic ware designations. Group affiliation is based on closely related types that demonstrate a "distinctive homogeneity in range of variation concerning form, color, technology, etc." (Gifford 1976:17). Petén Postclassic slipped groups include Paxcamán, Trapeche, Fulano, Topoxté, and Augustine. Types are defined as "aggregates of visually distinct ceramic attributes . . . which . . . are indicative of a particular class of pottery produced during a specific time interval within a specific region" (Sabloff and Smith 1969:278). Some Petén Postclassic types include Paxcamán Red, Fulano Black, Picú Incised, Chompoxté Red, and Graciela Polychrome. Finally, varieties are differences at the attribute level such as types of incising. Escalinata variety (black rim), Fulano variety, Thub variety (broad, post-fire incising), Akalché variety (banded designs), and Graciela variety are corresponding varieties for the Petén Postclassic types mentioned above.

Those scholars that use the type-variety system described above state that various classifications and typologies of pottery aid in the understanding of cultural reality because naturally created types used by archaeologists reflects societal activities. As Gifford (1976:32, emphasis added) states:

> In a theoretical sense it is possible to visualize the ceramic variety as a reflection of *overt individual* and small group behavior . . . , the pottery type as reflecting

> the interplay of both *covert individualness* and *covert culturalness*, and the ceramic group as reflecting overt *culture*, as this may be determined in pottery. I believe it is possible to postulate that the ceramic group is telling us of the everyday *ceramic activities* of a culture; that the pottery type is telling us of the subconscious ceramic value orientations of both the *culture* and the *individual*; and that the ceramic variety is an expression through pottery of individual and small social group preferences.

If what Gifford states is true, pottery types reflect cultural integration and possible interactions. However, some scholars question whether the type-variety system allows archaeologists to elucidate interpretation regarding social and economic issues beyond simple classification (Demarest 1986; Rice 1976).

Although the type-variety system is the main classification system used in the Maya region, three serious problems exist in its use. First, it is assumed that once a new name has been given to a new type of pottery, similar pottery from different sites and regions will be classified with the same designation. Unfortunately, rather than comparing similarities, many archaeologists magnify slight differences and unnecessarily define new pottery types. For example, Forsyth (1989:7), Ball (personal communication 1999), and Rice (personal communication 1998) all suggest that although Late Classic red slipped monochrome pottery from Guatemala and Belize is remarkably similar in terms of paste, slip, and form, many different type names that appear in Maya lowland ceramic reports establish false differences between the types. For example, Tinaja Red, Nanzal Red, and Belize Red are similar enough to be classified as the Tinaja Red type (Forsyth 1989:7). Unfortunately, ceramicists using the type-variety system have not consistently adhered to the original classification rules, with the consequence that archaeologists draw distinctions that may not exist.

Second, strict use of the type-variety system often leads to misclassification of sherds that come from the same vessel. Because of differences in firing over the surface of a vessel, uneven erosion patterns due to deposition, or placement of decoration or slip on a vessel, sherds from the same vessel may appear as two distinct types and possibly two different ceramic groups. For example, one sherd from a vessel may be incised and another not, and as a result, the two sherds may be classified as different pottery types. To decrease the problem of misidentification, Demarest (1986) advocates before-and-after reconstruction comparison of type classifications.

Finally, the type-variety system was created as a methodological tool to aid the archaeologist in comparative chronologies. Early archaeological projects and ceramic reports, such as those for the sites of Uaxactún (Smith 1955) and Altar de Sacrificios (Adams 1971), often artificially defined new classificatory levels based on changes in archaeological phases. For example, Saxche Orange Polychrome pottery of the Tepeu 1 ceramic sphere and Palmar Orange Polychrome pottery of the Tepeu 2 ceramic sphere appear similar but are artificially divided because they come from two different temporal contexts. Although the type-variety system is the starting point for many ceramic studies, many archaeologists place too much emphasis on the classification system to elucidate specific information about economic and political systems. As Shepard (1956:317) states, the type-variety system does not serve to answer questions concerning potter's knowledge, potter's capacity, or accidents of production. Therefore, when archaeologists use the type-variety system in ceramic analysis, they must realize its limitations.

In order to overcome the problems inherent in the type-variety system, pottery classification, based on attributes or features, must go beyond a simple type-variety classification in order to interpret cultural behavior (Rice1982: 48). Sabloff and Smith (1969) suggest that the archaeologist analyzes types, varieties, and modes of pottery in order to strengthen intersite comparisons. In addition to the analysis of modes, comparing pottery at the ware level eliminates the above concerns of types and varieties because the focus of classification is based on paste and/or surface characteristics. Debate exists as to the usefulness of combining paste and surface characteristics in the ware level. Rice (1976) suggests that archaeologists define wares based on paste or surface characteristics because they are two different subsystems. I base ware distinctions on the differences in pastes that include differences in texture, temper, hardness, and color. These differences may reflect the differences in environments. As such, ware level classification provides information about geographic location, time period, and paste attributes (Rice 1976; 1982:50). These characteristics inform the archaeologist more about political, social, and economic interactions than do the ceramic type (Demarest 1986: 54). Cross-cultural comparisons at this level also may be more helpful because it is less likely that an archaeologist will mis-classify sherds based on small paste differences and/or modal characteristics. This type of analysis has been suggested by Rice (1976) and Demarest (1986), but few ceramic analyses use the ware level for comparisons.

All Postclassic slipped sherds from the sites of Ch'ich', Ixlú, Zacpetén, Tayasal, Tipuj, Topoxté, and Macanché Island were classified as to ware, ceramic group, type, and variety (when possible).

II."Low-tech" Analyses

Color measurements, degree of dark coring, hardness measurements, surface treatment and manufacturing technique observations, rim diameter, thickness, form measurements, and refiring observations aid in the detection of Postclassic technological characteristics. These observational techniques of analysis allow me to group the five Postclassic slipped ceramic groups according to different technologies and styles. All sherds in the sample are subjected to each of the "low tech" procedures described below. Upon completion of the "non-technical" analyses, I re-grouped the sherds according to characteristics developed during this phase of analysis.

I.A. Color Measurements

Color measurements describe the color of the interior surface, the exterior surface, and the core color of sherds through the use of Munsell Soil Color Charts (Munsell Color Company 1975). The system standardizes color by organizing it into three variables: hue, chroma, and value. The Munsell soil charts provide numerical values as well as verbal color names and modifiers of specific hues (Rice 1987b:341). In addition to naming colors, Frankel (1994) demonstrates that by measuring the range and degree of occurrence of colors on pottery at different archaeological sites, one can infer variation within ceramic traditions as well as the degree of quality control or standardization. Thus, one can obtain considerable amounts of information from color alone. By establishing different color patterns, if they exist, it may be possible to distinguish technological behaviors and stylistic ethnic identifiers.

In order to quantify general patterns of slip color that may be specific to technological and stylistic behaviors, I calculated diversity indices (richness, evenness, and heterogeneity) of slips according to archaeological site and ceramic group.

Richness represents the relationship between the sample size and the number of colors. The greater the richness index, the higher number of colors in a given sample (Frankel 1994:212). Richness is calculated using the following formula (Bobrowsky and Ball 1989:formula 3)

$$R=S/\sqrt{N}$$

where S is the total number of colors and N is the number of sherds in the sample. Sample size influences richness measurements.

Evenness measures the number of sherds in the sample and the number of slip colors. A sample with a value of 0 and is completely homogenous, uniform, and highly standardized (Frankel 1994:213). On the other hand, a perfect evenness (value of 1) is characterized as a mixed assemblage or a broad spectrum of colors in even proportions (Frankel 1994:213). Evenness is calculated using the following formula (Pielou 1969:233)

$$J=H/H_{max}$$

where $H=\Sigma p_i \ln p_i$ ($p_i=n_i/N$, n_i is the number of sherds with a particular color and N is the total number of sherds) and H_{max} is ln S (S is the number of Munsell color hues, i.e., 10R, 7.5YR, etc.). Evenness indices assume all colors are present in all samples and "does not discriminate, for example, between those assemblages with equal representation of few or many colors" (Frankel 1994:213).

Heterogeneity combines measures of richness and evenness around a mean to produce an index of the complexity or structure of the sherd data set and not the individual sherd (Rice 1987b:202). High heterogeneity measures (closer to 1) indicate a wide array of colors that may be the result of varied types of interaction, stability and maturity in the ecological sense, probability of randomly selected sherds having the same color, and competition (Rice 1981:222). Heterogeneity is measured by the following formula (Simpson 1949)

$$D=1-\Sigma\{n_i(n_i-1)/N(N-1)\}$$

where n_i is the number of sherds with a particular color and N is the total number of sherds in the sample. Again, the heterogeneity index is skewed toward the most abundant color. However, this measure was successfully used by Frankel (1994) and will be used for this pottery sample.

II.B. Core Colors

Paste colors visible in sherd cross-sections may show distinctive colors resulting from a combination of paste constituents and firing conditions. A dark-colored core may result from a lack of primary removal of carbon by oxidation (dark core), or deposition of carbon from a reducing atmosphere (Rye 1981: 115). Core colors resulting from paste components and original firing and can be measured with published charts (Rye 1981: Figure 104). According to Rye (1981:116), core colors reflect sherds with the following characteristics: 1) oxidizing, organic material absent; 2) oxidizing, organic material present; 3) reducing or neutral atmosphere with organic material absent; and 4) reducing atmosphere with organic material present. Fully oxidized vessels or sherds contain no organic matter and have a uniform cross-section color. Clays fired in an oxidizing atmosphere that have a large amount of organics may show a gray or black core distinct from the surface color. However, core and surface layers may differ within the same vessel due to disproportionate heating, oxidation, and placement in fire. Sherds fired in a reducing or neutral atmosphere with a lack of organics exhibit a core center in which carbon deposits do not enter, and a diffuse margin may appear (Rye 1981:116). A reducing atmosphere, with the presence of organics, will appear in a sherd as a gray or black core.

I measured the degree of dark coring using a modified version of Rye's dark coring chart (Figure 2). Different cores were assigned a nominal value that allowed me to conduct statistical analysis of measurements of central tendency (mean), measurements of variation (standard deviation and range), and correlation coefficients for the sample according to ceramic group and archaeological site.

II.C. Hardness

Hardness was recorded in terms of resistance to scratching that is determined using the Mohs' hardness scale. Various types of hardness exist, and by using the Mohs' hardness scale, I measured scratch hardness. Interior surfaces, exterior surfaces, and

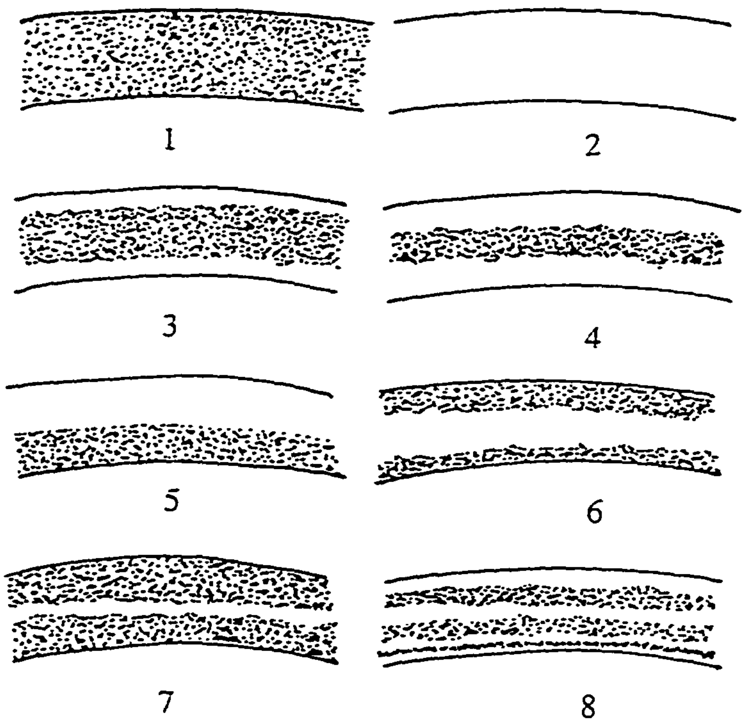


Figure 2: Stylized cross-sections comparing variations in the appearance of firing cores (after Rye 1981:134): 1) Oxidized or reduced atmosphere with organics present in the core (Volador Dull-Slipped ware); 2) Oxidized firing with no core (Clemencia Cream Paste and Vitzil Orange-Red wares): 3-4) Oxidized firing with difuse core margins: 5) Oxidized firing, coloring due to position in fire; 6-7) Reduced firing with "no core;" 8) Reduced firing demonstrating repeated rapid cooling with a "double core."

pastes are scratched in order to determine hardness characteristics of the slips and pastes. In addition to hardness of the sherd, other procedures are also being assessed with the Mohs' test: "the length and duration of firing, porosity, grain-size distribution, post-depositional environment and mineral composition all contribute to the 'hardness,' and although it should continue to be measured and recorded it is not a precise indicator (Orton, Tyers, and Vince 1993:138).

I measured scratch hardness with a Mohs' geological scale of minerals (see Table 3). Sherds were scratched before and after refiring experiments. The results were compared through statistical analyses of measurements of central tendency (mean), measurements of variation (standard deviation and range), and correlation coefficients for the sample according to ceramic type and archaeological site.

II.D. Surface Treatment and Decoration

Surface treatment and decoration are described. The most common surface treatment is burnishing, which can be visually and microscopically detected. Surface treatments, such as scraping while the clay is plastic, can be seen in the drag marks caused when grit or harder inclusions are dragged across the surface; the grains remain at the end of the drag. Design painting, impression, compression, or cutting are means of decoration that also appear in Petén Postclassic pottery. Design motifs, as well as other surface treatments, are described and illustrated when appropriate in order to compare stylistic attributes to technological characteristics.

Table 3: Mohs Scale of Hardness

Hardness	Mineral
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase
7	Quartz
8	Topaz
9	Corundum
10	Diamond

II.E. Refiring

Refiring procedures provide insight into the original firing conditions and original clay colors. By estimating the original firing temperature, information on time, temperature, and atmosphere characteristics of the pottery firing are provided. When refiring sherds at a temperature of 800°C, one is able to arrive at "a general picture of the variability in the kinds of clays the prehistoric potters used . . ." (Rice 1987b: 344). As a result of such analyses, a researcher can ask questions such as: 1) Are particular clays used for particular vessels? 2) Are different firing procedures used for different clays? and 3) Does dark coring result from an abundance of organics or is it attributable to another cause?

Six small pieces (approximately .5 cm) of each sherd were placed in an electric kiln with a constant atmosphere and pressure. The temperature was set at 275°C and the sherds "soaked" at that temperature for 15 minutes. This temperature drove off atmospheric water that may have accumulated in the pores. After 15 minutes, the temperature was set to 550°C and the sherds soaked for 15 minutes after that temperature was reached. After the soaking period, one sherd piece was removed from the electric kiln and placed in an electric drying oven set at 40°C. This process was repeated at 600°C, 650°C, 700°C, 750°C, and 800°C. After all of the sherd pieces had cooled, I compared the broken pieces from the different firing temperatures to the original sherd to estimate at what temperature the sherd might have been originally fired. In cases where sherds were fired below 550°C, the procedure described above was repeated but at lower temperatures: 300°C, 400°C , and 500°C.

II.E. Form Measurement

In addition to the above testing procedure, I conducted measurement-based classification of forms in order to suggest possible changes in technological, functional, and stylistic attributes of the different pottery groups. By measuring the diameter of rim sherds that comprise more than 10 percent of the total rim diameter of a vessel, I was better able to demonstrate variation in vessel size of a given ceramic group and/or form.

In addition to measuring rim diameters where possible, I also measured jar neck heights to determine formal categories related to function. After obtaining measurements of vessel rims and neck diameters, I conducted measurements of central tendency (mean) and measurements of variation (standard deviation and range) for each of the form classes (jars, bowls, plates, dishes etc.) defined by site and by ceramic group. The use of the various measurements aid in the determination of technological choices and vessel size during the Postclassic period.

III. Mineralogical Analyses

III.A. Petrographic Analysis

In order to further investigate the possibility of different technological styles in Postclassic slipped pottery, I examined 273 sherds from the different groups of pottery from each site. First, a preliminary examination of pastes with a binocular microscope was completed in order to observe gross modal differences in paste categories and to ensure that a representative sample was selected for petrographic analysis (Shepard 1956: 140-141).

Petrographic analysis allows the analyst to identify minerals that are present in the clay pastes of different vessels. Petrography allows analysis of many clay materials and inclusions at one time. One can study "the clay itself, natural inclusions in the clay, purposefully added inclusions, and glazes or slips on the clay surface" (Childs 1989:24).

Petrographic analysis has been adapted from geological techniques of analysis for the study of soils and rocks and is useful for archaeological ceramics because, to a large extent, geological sources differ enough regionally to allow for comparison of different clays (Blatt 1992). These methods are applicable to pottery analysis because pottery can be regarded as metamorphosed sedimentary rock due to the composition of a sherd consisting of clastic grains imbedded in a clay matrix which has been transformed to "rock" through the process of firing (Bishop, Rands, Holley 1982; Rice 1987b:376). Understanding these basic principles of geology plus other principles of optical mineralogy, allow the description of pottery pastes and clays.

Additionally, petrographic analysis can be used to establish technological characteristics within the Postclassic ceramic complex because petrographic analysis aids in the classification of sherds into specific groups (Childs 1989:24). This aspect of petrography is most helpful when a sherd or vessel cannot be assigned to a typology based on surface decoration, vessel form, or rim diagnostics (Shepard 1956:165). I anticipated that the above situation would arise because many of the sherds are highly eroded and because the variability within pastes may be great enough that I could not easily identify the ceramic group. As a result, paste characteristics (clay matrix and inclusions) were examined to establish possible differences between types.

Once a sherd or vessel is assigned to a ceramic group, I can develop additional behavioral information from a classification based on petrography because petrography can answer process-oriented questions from a diachronic or synchronic perspective (Carr 1990; Childs 1989). It is possible to create a time series (double lenticular pattern) that models shifts in technological characteristics such as paste and temper characteristics (Braun 1982; 1985). Braun (1982;1985) created such a model in which he was able to predict the date of Middle and early Late Woodland cooking pots based on changes in temper density. By comparing clay pastes, temper types, and frequencies, Braun (1985) and Carr (1990) state that it is possible to draw inferences about the cultural and technological conditions that affected the production of various pottery types.

Although petrographic analysis is important to this research design, there are some limitations. Thin-sectioning may not produce the full mineralogical composition of a pottery sample due to sampling error and because the method of producing thin-section slides involves grinding and polishing of the sample (Orton, Tyres, and Vince 1993). In addition to problems with sample preparation, petrographic analysis alone cannot determine the type of clay mineral in the sherd because of the refractive characteristics of clay minerals. Because of these limitations, petrography will be combined with x-ray diffraction in order to obtain a full mineralogical complement.

All selected pottery (described above) was cut with a wet saw for the preparation of thin section slides. The sherds were sent to Spectrum Petrographics where they were embedded in an epoxy block. The most fragile sherds were vacuum impregnated and then embedded in an epoxy block. The block was cut in such a manner that a thin section measuring .03 mm thick resulted. The resulting thin section allowed me to identify minerals in the clay paste with the use of a polarizing microscope.

The polarizing microscope is composed of a light source, a polarizer, a condenser, a rotatable stage, objective, slots for a quartz wedge, an analyzer, and a Bertrand lens. Light originates from a light source at the base of the microscope and passes through the polarizer that aligns the light waves in a single plane or direction. The polarized light then passes through minerals on the rotatable stage and bends them according to the mineral structure because each mineral and inclusion transmits light differently and is thus identifiable (McLaughlin 1977). The objective magnifies the resulting light waves and the light passes through an analyzer. Analyzers allow light to vibrate in a plane perpendicular to that of the first polarizer. When the analyzer is in place (crossed nicols), birefringence colors appear and can then be compared to published charts to identify the mineral. If the crossed nicol color, angle of extinction, and other mineralogical characteristics are not sufficient in the identification of the mineral, the Bertrand lens and condenser produce interference figures that determine the mineral's sign (uniaxial or biaxial). Interference colors, in addition to the techniques described above, allow identification of most minerals.

Thin-sectioning provides one objective means of classifying pottery pastes through the analysis of mineral size, shape, roundness, and frequency. Mineral size, shape, and roundness are established through a comparison of various graphs and tables (see Figures 3-5) (Shackley 1975:44-51). The most common geological method of determining the quantity of minerals in a thin section is point counting. Point counting determines the number of different minerals along a predetermined area (for example, 10 mm) of the length and width of the section (Chayes 1956). Various studies have employed different methods for counting the frequency of inclusions: Peacock (1973)

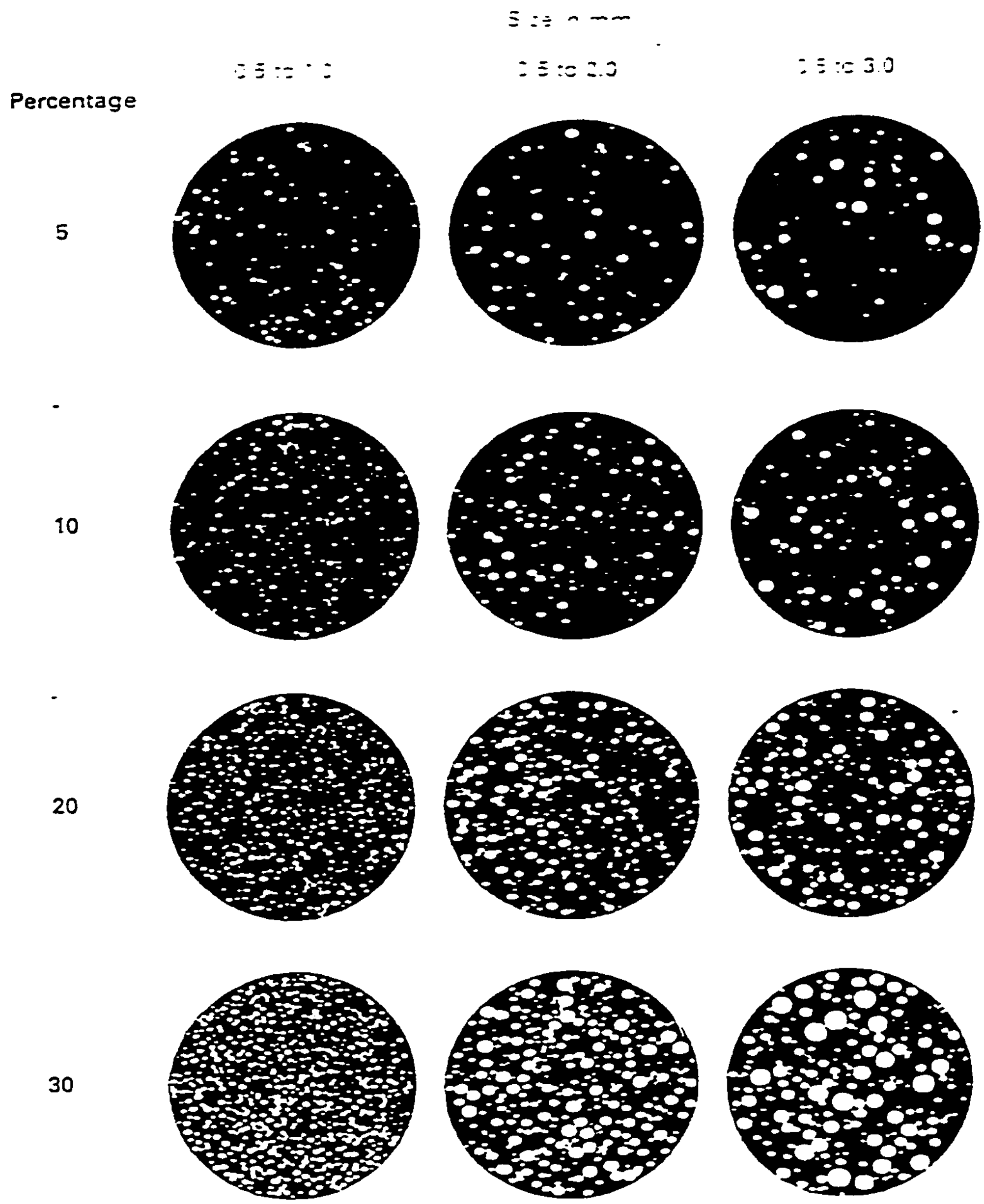
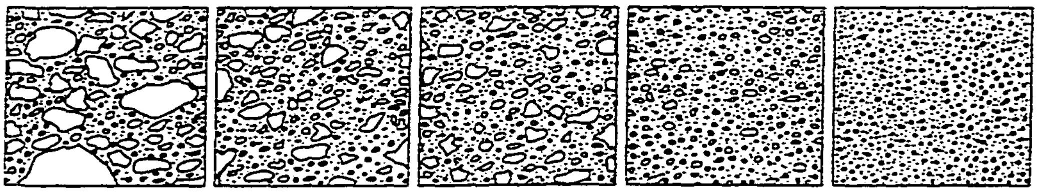


Figure 3: Percentage Inclusions Estimation Chart (Orton, Tyres, and Vince 1993: Figure A.4)

Scale for Pebble Sorting



Very Poor	Poor	Fair	Good	Very Good
1	2	3	4	5

Figure 4: Inclusion Sorting Chart (Orton, Tyers, and Vince 1993:Figure A.6).

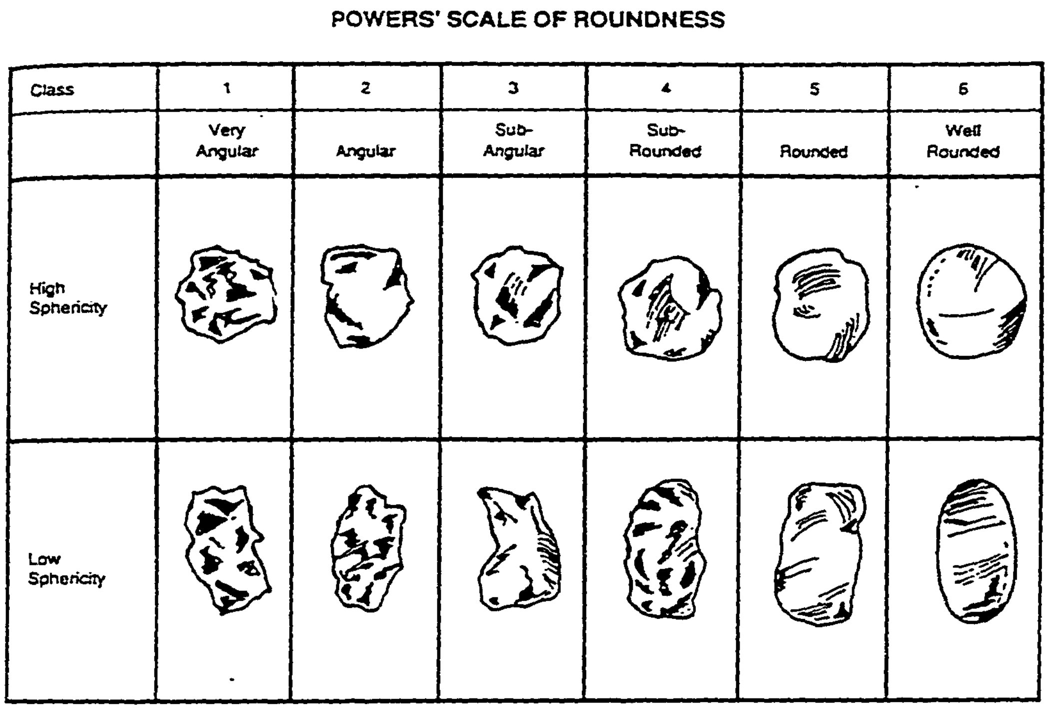


Figure 5: Sphericity/Roundness Estimation Chart (Orton, Tyers, and Vince 1993:Figure A.5).

uses a random grain selection, and Middleton, Freestone, and Leese (1985) use a variation of systematic sampling along linear transects with tests of accuracy for different thin-section samples. However, because I was not interested in the absolute number of minerals in the thin section, but rather in what minerals exist and their relative frequency, I used a non-volumetric area frequency counting method as described by Dickenson and Shutler (1979). They examined thin sections of Fijian pottery to determine that different temper types originated from different Pacific islands and were transported by boat to other islands. To determine that the pottery tempers were distinct and reflected different geological formation processes of the island chains, they used a non-volumetric area frequency count (Dickenson and Shutler 1979:1661-1662). Area counting pertains to counting all of the minerals in the standard image. Middleton, Freestone, and Leese (1985) compared area counting to standard geological point counting and determined that the number of minerals counted was equal and the only difference was that area counting resulted in a smaller mean mineral diameter. Because mean diameter of minerals was not critical to my study, I implemented area counting.

Before conducting an area count, I scanned the sherd to determine the range of minerals and mineral sizes as well as to note any details of manufacturing techniques and slip thickness. After determining the types of minerals present, I counted two standard image areas to ensure that each area was representative of the sherds as a whole and to detect changes in the clay matrix. The first counted area was located at the end of the slide farthest from the rim and the second was determined by rolling a die and moving the slide the corresponding number of centimeters. For example, if I rolled a 5, I moved the slide 5 cm and centered the microscope in an area that filled the standard image. For each mineral type, I measured the range of mineral sizes (the smallest and the largest), the relative frequency as determined by Figure 3, the degree of sorting as determined by Figure 4, the mineral roundness as determined by Figure 5, the number of minerals in the standard image, the frequency of all of the minerals in the clay matrix as determined by Figure 3, and the clay birefringence. Other abnormalities were also noted.

The frequency data were then converted to percentages based on the actual counts and the percentages examined by ternary diagrams to aid in the identification of Postclassic slipped pottery technological styles.

III.B. X-ray Diffraction

X-ray diffraction is used in conjunction with petrographic studies of pottery to identify clay minerals through their crystalline structure in order to understand the variability of the clay paste. It is a necessary complement to petrography because of the difficulties in identifying clay minerals through optical mineralogy. Because of this lacuna with x-ray diffraction identification of the clay mineral(s), I may be able to suggest possible working characteristics of those minerals that were part of the technological style of the vessel. This, in turn, would suggest behavioral and technological characteristics and choices that may contribute to the definition of Postclassic technological style (Klein and Hurlbut 1993:277).

X-ray diffraction is useful for the study of pottery pastes and inclusions because it can identify a small number of minerals in a clay or a fired sherd; however, because pottery frequently has many minerals as inclusions and as paste constituents, it cannot be used as a definitive method of analysis (Orton, Tyres and Vince 1993:20). X-ray diffraction is also useful in the identification of clay mineral constituents, and is most useful when the pottery has been fired at a high temperature (over 900°C) because some minerals can be better identified through the transformations they undergo at high temperatures (Mitchell and Hart 1989:145-147). These minerals which only form at high temperatures (anorthite, cristobalite, dehydroylated montmorillonite, gehlenite, lime, metakaolintie, mullite, periclase, spinel, and magnesium, and aluminum silcates) aid in the identification of minerals as inclusions and as paste characteristics (Mitchell and Hart 1989:148-149). However, refiring sherds to 900°C in this study did not create those high-temperature minerals yielding aluminum silicate peaks to identify clay minerals in the clay matrix.

Because clay mineral structures begin to collapse at temperatures around 400-600°C (see Table 4), only 17 sherds were available for XRD analysis. These sherds were estimated on the basis of refiring experiments to have had estimated firing temperatures below 400°C. In addition, a clay sample obtained from the lake shore of Zacpetén in 1998 and four clay samples from areas around Lake Yaxhá near the Topoxté islands collected by the CPHEP during the 1973-1974 field seasons were also analyzed to expand the sample of possible clay types used in the manufacture of pottery from the Petén lakes region.

Two methods of sample preparation were conducted to determine if similar results could be obtained in a less time consuming manner. The first method is described by Moore and Reynolds (1997) for use with the Millipore vacuum system. I removed

Table 4: Clay Minerals and Temperatures at Which Their Clay Structure Collapses

Clay Mineral	Temperature of Collapse (°C)*	Source
Allophane	100, 550-600	Nutting 1943:216
Kaolinite	400-600	Ross and Kerr 1931:166-170
Halloysite	400-500	Nutting 1943:210
Montmorillonite	100, 400-500	Ross and Hendricks 1945:48-54
Vermiculite	100, 250-400, 600-800	Nutting 1943:212
Illite	100, 350-600	Nutting 1943:211
Chlorite	500-550	Nutting 1943:212
Attapulgite	100, 200-400, 550-600	Nutting 1943:216

* A number of different ranges exist because there are different phases of water loss: the low range (around 100-275°C) represents the release of atmosphere water and the higher range temperatures (400°C up) represent the loss of OH^- lattice water.

exterior and interior surfaces using a Dremel motor tool, then crushed each sample with a mortar and pestle until fragments were approximately 5 mm in diameter. The crushed material was then sieved, placed in glass beakers, and distilled water was added until the water level reached 150 ml. The beakers were then placed in an ultrasonic bath for 15 minutes. After 15 minutes, I siphoned the water and clay-size particles suspended in the water and placed them in centrifuge cups. Additional distilled water was added to make the weight of each cup equal. The cups were then spun in a centrifuge chamber for two minutes at 10,000 rpm in order to separate clay-size particles from any other substances.

The next step involved the decantation of the dispersed suspension of clay-size materials. In order to obtain a "fair crystallite orientation" of the clay size particles, the centrifuged water mixture was placed in the Millipore filter transfer system (Moore and Reynolds 1997). According to Moore and Reynolds (1997), the Millipore method is the preferred method to orient clay minerals for qualitative analysis. I decanted the water into a vacuum filter apparatus that consisted of "a side-necked vacuum flask and a funnel reservoir clamped to a flat porous glass base" as well as a filter above the flat porous glass base (Moore and Reynolds 1997:217). After the material was filtered through the system, the filter paper was removed and placed against a glass slide. Pressure applied to the filter paper ensured a transfer of clay material from the filter onto the slide. The slides were then air dried for 24 hours before x-ray diffraction.

The second method of sample preparation was faster and less expensive. The sherd surfaces were removed using a Dremel motor tool, and samples were crushed using a porcelain mortar and pestle. The crushed sample was sieved through a 100 mesh screen so that only clay-sized particles would be used for XRD. Approximately one milligram of crushed sherd was placed in the center of a glass slide. Acetone was slowly added to the crushed sherd until a slurry was formed. The solution was evenly distributed over the slide using the end of a paper clip. The slide was allowed to air dry before x-ray diffraction.

Each slide, after being exposed to x-rays, was placed in an air tight container with ethylene glycol for a week. This was done to test for the possible presence of smectite and chlorite clay minerals. If the clay is a member of the smectite or chlorite group, the clay would swell changing the mineral's interplanar spacing (Moore and Reynolds 1997:242).

After the slides were dried and/or exposed to ethylene glycol, they were then placed in the x-ray diffractometer. (A discussion of how the x-ray diffractometer functions can be found in Moore and Reynolds 1997). The x-ray diffractometer measures the reflection of in-phase (not destructive) x-rays from the crystal structure of the mineral(s) in the sample. This identification results in d-spacing between the rows of atoms in the mineral (see Figure 6). D-spacing allows one to identify different minerals in a sample because each mineral's crystallographic orientation produces different intensities of x-rays and d-spacings (Moore and Reynolds (1997:69-71).

The mineral's identity can be determined using Bragg's law

$$2d \sin\theta = n\lambda$$

where d=interplanar spacing, θ=incident angle, n=any integer, and λ=wavelength. This equation relates "the wavelength of radiation, the periodicity of structure, and the angle of diffraction," thus allowing identification of minerals (Moore and Reynolds 1997:78).

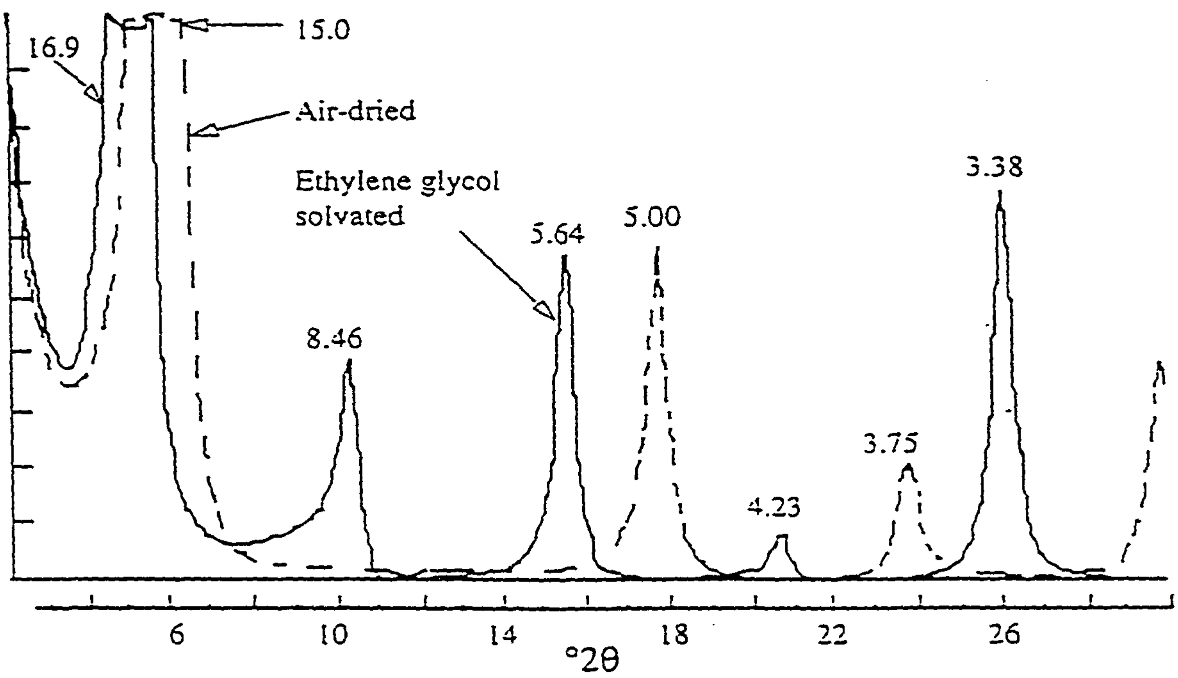


Figure 6: Montmorillonite Clay Mineral X-ray Diffraction Graph (Moore and Reynolds 1997:Figure 7.8).

A XRG 3100 X-ray generator and a XDS 2000 Sintag produced x-rays and recorded data for each sample. The x-ray energy source was set at 45 kV and 35 mA. Each sample was analyzed from 2 to 50 2θ which took approximately 48 minutes per sample. The diffractometer was calibrated before testing began to ensure the comparability of the resulting graphs. After the diffraction process was finished and the data collected, computer programs subtracted background noise, identified mineral peaks, and inserted or deleted peaks that had been misidentified. After peak correction, d-spacing was calculated for each peak.

I identified minerals through the comparison of d-spacing for each sample to d-spacings from published tables (Bayliss et. al. 1980; Brindley and Brown 1980; Chen 1977). The published tables provide d-spacing numbers for all known minerals according to their different crystallographic orientations. The tables also provide d-spacing intervals for those minerals, such as smectite and chlorite, that swell with the addition of water and/or ethylene glycol, making the presence of smectites and chlorites easily identifiable (See Table 5).

IV. Chemical Analyses

Two methods of chemical analyses, energy dispersive x-ray spectroscopy (EDS) and acid-extraction ICPS, were conducted to answer two different research questions. EDS and scanning electron microscopy (SEM) analyses aided in the qualitative detection of possible clay minerals and photographs of the clay minerals. This was necessary because of the limitations of the XRD with regard to firing temperatures and clay structures discussed below. In addition to SEM and EDS, strong acid-extraction ICPS tested the bulk sherd composition to achieve a quantitative analysis of Maya pottery manufacturing choices necessary for the definition of technological styles.

IV.A. Energy Dispersive X-ray Spectroscopy (EDS) and Scanning Electron Microscopy (SEM)

IV.A.1. Energy Dispersive X-Ray Spectroscopy. I conducted EDS analysis on a sample of 100 sherds (the same sample for ICPS analysis) in order to determine the clay mineral(s) that constitute the clay paste. This type of analysis is necessary because XRD analysis is only successful in detecting clay minerals that have been fired below 400°C because clay mineral structures begin to collapse at that temperature. Therefore, EDS analysis was conducted before XRD analysis in order to determine possible clay groups from which to test a subsample. Unfortunately, it was impossible to analytically determine the clay mineral(s) because of the dispersive effect of the electron beam. However, the results did produce elemental suites of the entire clay paste that could then be subsampled through XRD.

Elemental x-ray analysis is the result of an electron beam striking a sherd and emitting different types of energy signals that are detected by the SEM. An electron beam is generated in the illuminating system that consists of an electron gun and three condenser lenses to refine the probe (Bozolla and Russell 1999:371). The x-ray beam is emitted and strikes the shell electrons of the sample which in turn ejects the inner shell (Bozolla and Russell 1999:376). For example, elements with atomic weights below

Table 5: Minerals and Their D-Spacing (from Moore and Reynolds 1997:227-260)

Mineral	D-Spacing (in order of intensity)
Calcite	3.04, 2.29, 2.10, 2.50, 3.86
Dolomite	2.89, 2.19, 1.787, 2.02, 2.67
Gypsum	2.87, 4.28, 2.68, 7.61, 3.07
Biotite	1.538
Hematite	2.69, 2.20, 1.838, 1.692, 2.51
Halloysite	4.41, 2.562
Illite	10.1, 3.38, 5.00
Kaolinite	7.20, 3.58
Low Quartz	3.342, 4.27, 1.818, 1.541, 2.457, 2.282
Chlorite	7.10, 3.55, 14.2, 4.74
Montmorillonite (glycol-solvated)	16.9, 3.38, 5.64, 8.46, 4.23

electrons (Bozolla and Russell 1999:374). X-ray energy that is released as a result of the reaction and is then detected and recorded as a peak by a silicon detector crystal (Figure 7). "Different elements will fill the vacancies in shells in unique ways. This means that since each element will generate a unique series of peaks, the spectrum may be used to identify the element" (Bozolla and Russell 1999:374).

Unfortunately, the selected point of a specimen is not always the only matter measured by the emission of x-rays. Although a probe of electrons is aimed at a specific spot on the sample, the resulting x-rays come from a predetermined spot and the surrounding area (see Figure 7). Therefore, it is highly unlikely to obtain an elemental analysis of a clay mineral in a sherd unless a clay mineral can be separated from the sample sherd.

The detector consists of a silicon disk injected with lithium to correct impurities in the silicon mineral structure (Bozolla and Russell 1999:376). The resulting peaks of intensity come from the proportion of dispersed x-ray energy and the silicon disk current. Because the detection apparatus must be housed in a vacuum structure cooled by liquid nitrogen, low energy x-rays are absorbed by the detector window and are not recorded beryllium (carbon and sodium) may be detected at lower intensities. Therefore, quantitative results are not possible.

One hundred pottery sherd samples were obtained from the epoxy blanks used in petrographic thin section preparation. The blocks were ideal because they have a flat surface and contain epoxy material that does not transmit a x-ray if struck by the electron beam. The epoxy blocks were cut to approximately one centimeter squares and sprayed with freon to remove oils and other stray particles. They were mounted to a numbered

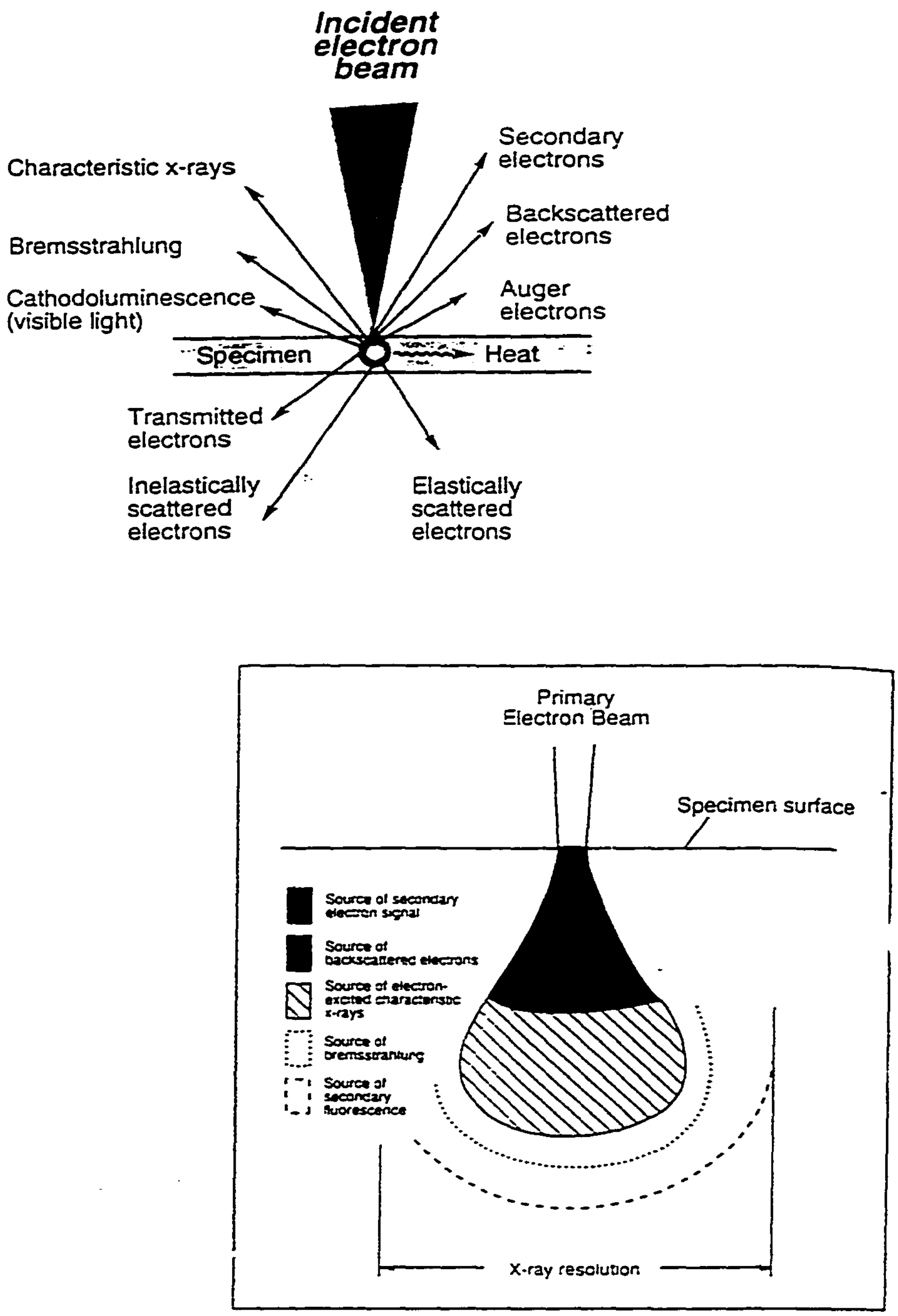


Figure 7: EDS/SEM Beam Dispersion (Bozolla and Russell 1999:Figure 15.1, 15.17)

aluminum rectangle with a carbon paint.

After drying overnight in a 50°C oven, the samples were placed in the vacuum chamber of the S2460 N Scanning Electron Microscope with X-ray Detector. The vacuum was allowed to stabilize for 15 minutes. The S2460 N ran at 30kV, 25Pa(scal), 70x magnification with a 15 mm working distance and a 215 beam current. Once the sherd sample was in view, it was scanned to find a location that was relatively free of possible inclusions. The electron beam was placed on the focus point and data were collected for 100 seconds. Data are presented in the form of graphs with relative elemental intensities. I created ceramic paste elemental groups from the intensity information.

IV.A.2. Scanning Electron Microscopy. SEM photographs were taken of the clay pastes to further identify possible clay minerals. Scanning electron microscopes allow for high magnification and high resolution images of specimens. The microscope has a series of lenses (three condenser lenses) that control the spot size (demagnification), focal length, and electron beam (Bozolla and Russell 1999:208). Magnification is changed by adjusting the length of the electron beam and the final condenser lens creates the final demagnification to finely focus without losing beam electrons. This process occurs in a cathode ray tube that contains two sets of deflection coils and a stigmator. "The deflection coils are connected to a scan generator to raster the electron spot across the specimen. Rastering not only moves the spot in a straight line across the specimen, but also moves the spot down the specimen as well" (Bozzola and Russell 1999:208).

When the electron beam with a specific low voltage comes in contact with a conductive surface, a number of rays are produced as discussed above and collected in the cathode ray tube to display an image. Rays can only be emitted after the specimen has been made conductive. The image can them be digitalized or photographed directly from a monitor.

Twenty-five freshly broken sherd fragments, approximately .5 cm in length; representing each group of elements detected from EDS, were affixed to a numbered aluminum rectangle by carbon paint. The aluminum rectangle and sherd fragments were placed in a drying oven set at 50°C and allowed to dry overnight. The samples were then placed in a direct current sputtering device that removed water and oxygen from the chamber and the sherd voids to a level of .1 Pa. When this pressure was achieved, argon entered the chamber to create a negatively charged field into which gold was introduced. A thin layer of gold was sputtered on the sherd surface as a result of bouncing gold and argon molecules. The thin gold coating ensured conductivity with the electron beam.

Once the sherds were coated, they were placed in the vacuum tube of the SEM. The SEM was set at 20 kV and a magnification of 11,000X . All photographs were taken at the same magnification to ensure comparability and were then compared to published clay mineral SEM photographs.

IV.B. Strong Acid-Extraction Inductively Coupled Plasma Spectroscopy (ICPS)

The final type of analysis that I conducted with the ceramic sample was strong acid-extraction ICPS. Fifteen sherds from each of the four ceramic groups at each of the archaeological sites (total of 100 samples) were randomly selected through stratified random sampling methods discussed below. Acid extraction is a chemical compositional characterization that detects levels of the following elements: Al, Ag, As, B, Ba, Be, Ca, Cd, Co, Cr, Cs, Cu, Fe, K, La, Mg, Mn, Na, Ni, Pb, Rb, Sb, Sc, Se, Si, Sr, Tl, Ti, V, and Zn.

Unlike other chemical characterization tests that are bulk methods of analysis, strong acid-extraction ICPS analyzes the ceramic paste in order to demonstrate the behavioral practices that are represented in the paste. This method makes no pretense to testing only the clay, but analyzes the chemical composition of the clay, the temper, and the firing temperature (Burton and Simon 1996:408). Because different technologies and pottery groups display different technological characteristics such as clay and temper, variability in chemical signatures indicates the differences in technological choices. Thus, one can obtain results that predict the above behavioral characteristics because "the variability is a virtue that informs us about technological choices" and it is these choices in technology that are essential to understanding technological style (Burton and Simon 1996: 408).

Strong acid-extraction ICPS is a controversial chemical compositional analysis method because some scholars believe that the "noise" produced in the analysis nullifies its usefulness (Neff et al. 1996:389). Although "noise" results from the mixture of clay, temper, and firing temperatures, it is the "noise" that indicates technological variability (Burton and Simon 1996). Some scholars question the reliability of acid-extraction analysis because it cannot produce "definite groups that form recognizably distinct centers of mass in the elemental concentration space" (Neff et al. 1996:390). However, acid-extraction does not attempt to source clay bodies, but it rather detects the "variability and contrasts among such vessels, regardless of the locations of their raw material sources" in order to indicate subtle differences in the manufacturing processes that can indicate different technological styles and ultimately different pottery groups (Burton and Simon 1996:409). For example, Burton and Simon conducted weak acid-extraction ICPS on pottery samples from Grasshopper Plateau, Arizona to determine which vessels were exchanged into the area and which vessels were made locally based on the grouping of different elements.

Therefore, acid-extraction is ideal for this research because it detects variability reflecting technological choices that may have been so small as to not be detected by the non-technical, petrography, or x-ray diffraction analyses. With the addition of strong acid-extraction ICPS to the methodology, I am better able to demonstrate the technological choices of Postclassic potters.

Acid digestion is a procedure used to determine the total concentration of the elements in solid matrices by solubilizing all the elements of interest. Acid digestion indicates the maximum amount of an element present irrespective of whether normal environmental conditions might result in its release. For this to be successful, two distinct tasks must be completed. First, the digestion procedure must decompose the sample matrix to expose the entire mass to the acid cocktail. Second, digestion must react with the elements of interest to form water-soluble compounds (Sisir Chaturvedula, personal communication 1999). Ultimately, the digestion process ensures that behavioral traits and chemical compositions are being tested.

Acid digestion results from the following procedure. Slipped and painted surfaces of 100 selected sherds were removed using a Dremel tool. The resulting clay body was then ground using a mortar and pestle to obtain a 200 mg sample of grains of 100 mesh or smaller. Weighed samples were placed into100 ml teflon beakers. Twenty milliliters of aqua-regia (3HCl:1N) and 20 ml HF were added. The samples in the solution were placed on a hot plate at 300- 400°F under a hooded fan and heated until the solution evaporated. When the solution evaporated, I rinsed the beaker walls with deionized water and the sample was heated to dryness a second time. These boiling steps remove HF from the solution and eliminate reactions with boron-bearing glass parts of the ICP spectrometer. Once evaporated, the sample was cooled, I added 1 ml of HNO_3 and 5 ml of deionized water to the beaker and heated it for 5 minutes to warm the solution to 70° C and redissolve the sample. An additional 30 ml of deionized water was added to the sample and heated for 15 minutes to dissolve the residue. I then added 50 milliliters of deionized water to a 100 ml glass volumetric flask and diluted it to100 ml with deionized water. The final solution was immediately transferred to a polyethylene bottle and placed in a refrigerator to cool completely before being analyzed.

A Perkin Elmer Plasma 400 Emission Spectrometer detected elements from the clay sherd samples in the aqueous solution described above. The sample was introduced to the plasma spectrometer through a pneumatic nebulizer. "In these devices the sample carrier gas flow is blown across the mouth of a capillary tube, along which the sample solution is either drawn by the gas flow or pumped by a small peristaltic pump . . ." (Gray 1988:263). The solution reached the chamber that contained a central filament of heated gas. Argon gas interacted with a Tesla copper coil to produce an intense plasma fireball that reached temperatures between 5,000-10,000° K (Gray 1988:260, 262). The introduced sample spent several milliseconds at the high temperatures becoming ionized. A nickel skimmer then extricated the ionized droplets from the plasma flame and immediately cooled them to "freeze" them in composition (Gray 1988:268). After passing through the skimmer, an electrostatic lens system collected the ions and introduced them into the mass analyzer where they were detected by an ion detector (Gray 1988:68). The computer then generated concentration data in parts per million based on a known standard mixture (see Table 6 for standard concentration used here).

Before analyzing the sherd samples, a series of standardized samples and blank (deionized water) samples were tested to calibrate the Perkin Elmer Plasma 400 Emission Spectrometer. First, the standards were analyzed. Next, a blank was tested. The blank served two purposes: 1) to test the system and 2) to clear the system. The sample

Table 6: Concentration of Elements in Group 1, Group 2, and Group 3 Standards

	Group 1 Elements		Group 2 Elements		Group 3 Elements	
Element	Standard 1	Standard 2	Standard 1	Standard 2	Standard 1	Standard 2
Ag			.50	.50		
Al	10.00	1.00				
As	2.5	.25				
B	40.00	4.00	2.00	.20		
Ba	10.00	1.00				
Be	.75	.075				
Ca	800	580	400	140		
Cd	1.50	.15				
Co	2.5	.25				
Cr			1.00	.10		
Cu	1.25	.125				
Fe	5.00	.50	100	10		
La					45	14
Mg	400	40	10	1		
Mn	31.00	3.10				
Mo	10.5	1.05				
Ni			10	1		
Pb	5	.5				
Sb			2.00	.20		
Sc					30	4
Se	2.00	.20				
Sr					350	10
Ti					15000	200
Tl	2.00	.20				
V	2.5	.25				
Zn	1.5	.15				

standard was analyzed a second time and the results were compared. After the blank was analyzed, the results were compared and as long as the standardized sample was within 10 percent of the accepted range and the blank read 0 ppm for all elements, analysis continued. If the standards were more than 10 percent incorrect, a new standard sample was made and tested. This procedure was repeated for all three standards. Each sherd solution sample was analyzed and parts per million counts for each of the elements are listed. Between samples, deionized water was allowed to circulate through the spectrometer to flush the system of any remaining sherd solution. After 12 sherd samples, standards were analyzed again to ensure proper calibration.

Concentrations of elements were measured in parts per million. Table 7 presents the lowest detection limits set by the Perkin Elmer Plasma 400 Emission Spectrometer (Boss and Fredeen 1989).

Because Na, K, Cs, and Rb could not be made into a concentrated standard solution that could be detected by the plasma spectrometer, elemental concentrations were achieved through atomic absorption. I tested all 100 sherd solutions for each of the four elements listed above. The atomic absorption spectrometer was calibrated for each element at the following concentration of parts per million: Na 500, 200, 100; K 100, 50, 20; Cs and Rb 100, 50, 20. The calibration procedure followed that for the plasma spectrometer described above. After 20 samples were analyzed, the standards and blanks were analyzed to check the atomic absorption detector calibration. The lower detection limits for the four elements are listed above in Table 7.

Table 7: Lower Limits for Detection by Plasma Spectrometry

Element	Detection Limit (ppm)
Ag	.07
Al	.45
As	.53
B	.10
Ba	.013
Be	.0027
Ca	.1
Cd	.025
Co	.07
Cr	.061
Cs*	1
Cu	.054
Fe	.062
La	.1
K*	1
Mg	.0015
Mn	.014
Mo	.12
Na*	1
Ni	.15
Pb	.42
Rb	1
Sb	.32
Sc	.015
Se	.75
Sr	.0042
Ti	.053
Tl	1.2
V	.075
Zn	.018

* indicates elements that were detected by atomic absorption.

The elemental concentrations were then normalized using base-10 logarithms. Normalization of the data served to "equalize the extent of variation among the variables" (Bishop and Neff 1989:63). Normalization was necessary because of the use of two different types of spectrometry, two different sets of concentration figures, and possible skewing due to excessively high or low concentrations. From the normalized data, multivariate statistics and bivariate plots of elemental concentrations examined for possible structure in the sample. By using multivariate statistics, complex variances of pottery elements were presented as a group of all of the elements rather than as single elements. Therefore, groups based on elemental concentrations were given shape and located in space (Bishop and Neff 1989:60-63).

Two types of clustering procedures determined elemental groups in the sample: cluster analysis using hierarchical cluster analysis and Ward's method and factor analysis. Cluster analysis is used before factor analysis to obtain the number of possible groupings to be tested with factor analysis. Hierarchical cluster analysis locates the closest pairs of samples with similar elemental concentrations according to a distance measure and places them in a cluster. The initial pairing is joined by others similar to it or separated from those dissimilar from it until all samples are accounted for and all the data appear in one cluster. The procedure is hierarchical because the one large cluster encompasses clusters from earlier stages of clustering that contain clusters from still earlier stages of clustering. Ward's method of cluster formation calculates means for all variables in each cluster and "for each case the squared Euclidean distance to the cluster means is calculated" (Norušis 1988:228). Each step of clustering results from the merging of samples with the smallest increase in the total sum of squared within-cluster distances (Norušis 1988:228). The result is spherical clusters with minium variance.

After obtaining the clusters of sherd samples with similar elemental concentrations, factor analysis was completed using a variance-covariance matrix with varimax rotation. As a result of the variance-covariance matrix, eigenvalues were calculated. Eigenvalues describe the shape of the data that has one axis for each variable. When the eigenvalues are multiplied by their eigenvectors and rotated to enhance interpretability, they produce principal components (Bishop and Neff 1989:64). Principal component analysis calculates the linear combination of variables used to maximize the distance between group means and calculates the variation of each dimension in a multivariate space (Norušis 1988:201). As a result of this type of calculation, the first principal component accounts for the maximum variance in the sample. The second principal component accounts for the second largest variance in the sample and so forth until all of the variance in the sample is accounted (Bishop and Neff 1989:64). Each component represents a set of reference axes that are orthogonal combinations of the original data and this preserves the original integrity of the data set. From principal component data, two- and three-dimensional plots are produced that graphically demonstrate data groups.

The above methods of analyses and sampling procedures allowed me to understand the variability in technological and design choices that were made in the manufacture of the Postclassic pottery from the seven sites in this project. All types of analysis produced data that relate to behavioral choices made during choosing resources, during processing of the resources, during the choice of tools and amount of energy used for manufacture, and that reflect the general knowledge of pottery manufacture. Type-variety, "low-tech,", x-ray diffraction, SEM and EDS, and strong-acid extraction ICPS analyses suggested the physical properties of the clays. Type-variety, petrographic, x-ray diffraction, and SEM and EDS analyses produced data that correspond to the mineralogical identification of the pottery. Finally, chemical identification of the pottery was obtained through SEM and EDS and strong acid-extraction ICPS analyses. As a result of the combination of all of the data obtained through the various methods of analysis, I was able to interpret the behavioral characteristics used in the manufacture of the pottery vessel.

CHAPTER 5

POSTCLASSIC SLIPPED POTTERY CLASSIFICATION

The following descriptions cover the five Postclassic slipped pottery groups (Paxcamán, Fulano, Trapeche, Topoxté, and Augustine) and three ware categories (Volador Dull-Slipped ware, Clemencia Cream ware, and Vitzil Orange-Red ware). Proyecto Maya Colonial excavations at Ch'ich'', Ixlú, and Zacpetén produced a large quantity of Postclassic slipped pottery from which the sample for this study was taken. In addition to the sample from Petén archaeological sites, the sample of pottery from Tipuj was obtained from a collection from Complex I excavations in 1982 and curated at Southern Illinois University Carbondale (Cecil 1999). As a result of a thorough laboratory analysis of pastes, slips, and forms in the field, Dr. Prudence M. Rice and I identified seven new varieties, four new types, and one new pottery group (Fulano Ceramic Group). Below is a list of wares, ceramic groups, and ceramic types and varieties that are described in more detail in the chapter. These new groups and types expand the typology of Postclassic ceramics originally described by Bullard (1970), Chase (1983), Cowgill (1963), and Rice (1979, 1984, 1985,1987).

List of Wares, Groups, and Types Used In This Study (*indicates new

Group/Type/Variety)

Volador Dull-Slipped Ware

Paxcamán Ceramic Group

Paxcamán Red: Paxcamán Variety

Paxcamán Red: *Escalinata Variety

Ixpop Polychrome: Ixpop Variety

Sacá Polychrome: Sacá Variety

Sacá Polychrome: *Rasgo Variety

Macanché Red-on-paste: Macanché Variety

Macanché Red-on-paste: *Tachís Variety

Picú Incised: Picú Variety

Picú Incised: Thub Variety

Picú Incised: *Cafetoso Variety

*Fulano Ceramic Group

*Fulano Black: Fulano Variety

*Sotano Red-on-paste: Sotano Variety

*Mengano Incised: Mengano Variety

*Mengano Incised: Bobo Variety

Trapeche Ceramic Group

Trapeche Pink: Tramite Variety

Mul Polychrome: Manax Variety

Picté Red-on-paste: *Ivo Variety

Xuluc Incised: Xuluc Variety

Vitzil Orange-Red Ware

Augustine Ceramic Group

Augustine Red: Augustine Variety

Pek Polychrome: Pek Variety

*Graciela Polychrome: Graciela Polychrome

Hobonmo Incised: Ramsey Variety

Hobonmo Incised: Hobonmo Variety

Johnny Walker Red: Black Label Variety

Clemencia Cream Paste Ware

Topoxté Ceramic Group

Topoxté Red: Topoxté Variety

Pastel Polychrome: Pastel Variety

Canté Polychrome: Canté Variety

Chompoxté Red-on-paste: Chompoxté Variety

Chompoxté Red-on-paste: Akalché Variety

Chompoxté Red-on-paste: *Kayukos Variety

Dulces Incised: Dulces Variety

Dulces Incised: *Bebeto Variety

This chapter is organized in the same manner as other published ceramic reports with the inclusion of a category for the types of analyses performed on each ceramic type and the number of sherds per type per type of analysis. For each ceramic type, the pottery name (type and variety), frequency, ware, where and who established the type, principal identifying modes, paste and estimated firing temperature, surface treatment and decoration, forms and dimensions, illustrations (the key for illustration colors appears in the Appendix), intrasite references, and intersite references is included. Intrasite references include contextual information from Ch'ich', Ixlú, Zacpetén, and Tipuj. Pugh (2000) provides structure information from Zacpetén and Sanchéz Polo (1999) describes structures from Ixlú. Intersite information includes my own observations of pottery collections from Tayasal (from Chase's collection at the University of Central Florida), Macanché Island (from Bullard's collection curated at the Florida Museum of Natural History), and Topoxté Island (from Hermes' collection at Yaxhá and Bullard's collection at the Peabody Museum). In addition to these data, comparative Postclassic pottery and socio-political organization observations from published reports from the last 46 years from excavations in Belize, northern Yucatán, and Honduras are utilized throughout the report. A brief history of Postclassic pottery analysis is presented below.

Many ceramic analyses in Petén, focus on Late Classic Maya pottery and only briefly mention Postclassic pottery. Because Postclassic pottery from Uaxactún (Smith 1955), Tikal (Adams and Trik 1961; Culbert 1973), Altar de Sacrificios (Adams 1964, 1971, 1973), and Seibal (Sabloff 1973, 1975) are different in paste and decoration from that of the Late Classic period, the authors suggested that the Postclassic pottery was a result of remnant, refugee populations (Uaxactún and Tikal) or the result of invading/replacement populations from the Tabasco or the Puuc regions that introduced fine paste pottery, censer cults, and "foreign" decorative features (Altar de Sacrificios and Seibal). More recently, Foais (1996:719) stated that pottery from Punta de Chimino and Tamarindo resembled that of Macanché Island because of the presence of the Paxcamán and the Pozo ceramic groups. The presence of some of the Petén Postclassic ceramic groups may represent a reoccupation of Punta de Chimino and Tamarindo during the Postclassic period by people who had contact with the central Petén lakes region or it may represent a migration of people from the Petén lakes region into the Petexbatun region (Foais 1996:720).

In the Petén lakes region, Postclassic ceramic analyses from Tayasal, Macanché Island, and Topoxté Island suggest ceramic variability. Chase (1983, 1985) examined the Postclassic pottery from Tayasal and provided a ceramic chronology that roughly correlates to that of Uaxactún and Belize. The Chilcob (New Town/Terminal Classic), the Cocohmut (Early Postclassic), and the Kauil (Late Postclassic) ceramic phases are defined because of the differential presence of the Augustine, the Trapeche, and the Paxcamán ceramic groups (Chase 1983:1216-1225). The Chilcob ceramic phase represents the advent of the Augustine and the Trapeche ceramic groups and Chase associates the presence of these groups with the presence of two ethnic groups at Tayasal. In the Cocohmut and Kauil ceramic phases, the Paxcamán ceramic group is prevalent and some Topoxté ceramic group pottery appears in the latter phase. According to Chase (1983:1223), in addition to the introduction of the Paxcamán and the Topoxté ceramic groups, the Paxcamán ceramic group pastes become more granular and darker gray in the Kauil ceramic phase. He suggests that the changes in ceramic phases represent a new population from northwest Petén that came into the Petén region and co-existed with remnants of Late Classic populations (Chase 1983:1278). This new group introduced the Augustine ceramic group. Migrations of new populations into the Petén lakes region with new ceramic groups continued throughout the Postclassic period.

Cowgill (1963) described Postclassic pottery from Flores Island that included the

Augustine, Paxcamán, and Tachís ceramic groups. He believed that the pottery decorated with reptilian/serpent motifs from Flores Island represented a substantial movement of people that may have come from northern Yucatán (Cowgill 1963).

Rice (1980, 1987a) examined the ceramic material from Bullard's excavation at Lake Macanché. She demonstrated that during the Postclassic period a great deal of variety existed in paste and slip characteristics. The variability resulted from a population of potters that lacked technological expertise and experimented with slip colors and firing techniques (Rice 1980:78-79). From her extensive studies of pottery from this site, she suggested that the pottery was made locally by social groups that shared decorative motifs and stylistic identities (Rice 1987a:100-101).

Pottery from Topoxté Island was initially described by Bullard (1970, 1973) and reexamined by Rice (1979). Rice (1979) also examined pottery from Central Petén Historic Ecological Project (CPHEP) excavations on Canté Island. Bullard (1970) defined the Isla Ceramic Complex based on the presence of ceremonial and non-ceremonial Topoxté ceramic group pottery. He suggested that the pottery at Topoxté Island had affinities to that of the Tulum ceramic group because of the presence of scroll feet and tripod plates (Bullard 1970:302). Although similarities to pottery in northern Yucatán exist, Bullard suggested that the pottery at Topoxté Island reflected a local population's derivative of northern Yucatán types and decorations. In addition to defining the Isla Ceramic Complex, Bullard (1973) also developed a ceramic chronology based on the "Central Petén Postclassic Tradition." The complicated chronology, that is not longer used, suggested a stylistic break between the Classic Maya and Postclassic Maya populations suggesting Postclassic peasant-level groups without political control (Bullard

1973).

Rice (1979) examined the Isla Ceramic Complex pottery from Topoxté Island and Canté Island and refined Bullard's initial Topoxté Red typology. Her study suggested that this pottery was different from that of the New Town ceramic sphere and that it reflected local Petén types that resembled those in northern Yucatán (Rice 1979).

Excavations in Belize also produced Postclassic pottery. At Barton Ramie, Gifford (1976:288) defined the New Town ceramic sphere that includes the Augustine (Early Postclassic) and Paxcamán (Late Postclassic) ceramic groups. Sharer and Chase (1976:290) suggested that the change in pottery types between the Terminal Classic period and the Postclassic period resulted from a decline in Early Postclassic populations that were making older styles of pottery and the introduction of refugee groups and migrations of people from northern Yucatán. They noted that form, decoration, and paste characteristics resemble those of the Petén lakes region.

Analysis of the ceramic collections from Tipuj has been undertaken by many archaeologists (Cecil 1999; Foor 1994; Rice 1984, 1985; and Wilson 1991). Rice (1984,1985) synthesized the collection according to ceramic complexes from the Preclassic period to the Historic period and provided comparisons of Tipuj pottery to central Petén pottery. She also defined the ceramic complexes for the Postclassic period and suggested that the Postclassic pottery is a mixture of local and imported items that are more similar to pottery from the Petén lakes region than from northern Belize or Yucatán (Rice 1985). In addition to Rice's work, two Master's students (Foor 1994; Weber-Wilson 1991) produced theses based on pottery from Tipuj. Foor (1994) analyzed Late Postclassic censer material from Structure 2 of Complex I to determine how censers formed a stylistic, functional, and behavioral unit that reflected ritual events such as *katun* and *uayeb* rituals. Weber-Wilson (1991) examined Johnny Walker Red pottery to determine its temporal significance at Tipuj and possible communication networks of the inhabitants.

Postclassic pottery from Lamanai (Graham 1987; Pendergast 1986) also demonstrates the regionalization typical of many other areas. Postclassic Lamanai is characterized by the introduction of new pottery forms that are part of the Chichen ceramic sphere and show affinities to Mayapán.

Walker (1990) noted the presence of Postclassic pottery at Cerros in northern Belize. The Postclassic ceramic phase (Kanan) is characterized by pottery typically found at Mayapán. She (1990) states that Postclassic Cerros became integrated into the Postclassic occupation by Chetumal Bay populations conducting pilgrimages to the site. This is supported by the theory that the Postclassic pottery was imported and that the Kanan complex consisted only of ritual wares found in northern Belize and Yucatán.

Valdez (1987) noted the presence of Paxcamán and Augustine ceramic group pottery at Colhá. Locally produced Postclassic ceramics identical to those of Lamanai occurred in association with lithic workshops (Valdez 1987:14, 251). The Postclassic occupation does not resemble that of early time periods leading Valdez (1987:251) to suggest that Postclassic Colhá was occupied by a new Maya population from Yucatán that exploited the chert resources.

Postclassic pottery from Santa Rita (Chase 1985), Tulum and Tancah (Sanders 1960; Miller 1985) and Ichpaatun (Sanders 1960) resembles that of Mayapán. Chase (1985) stated that although the redware and censer pottery at Santa Rita is similar in form and slip to that of Mayapán, regional differences in pastes and firing techniques suggest that the pottery from Santa Rita was locally produced. Sanders (1960) and Miller (1985) reported that redware pottery from Tulum, Tancah, and Ichpaatun has close ties as to form and decoration to other Postclassic ceramic complexes on the east coast of Yucatán as well as Mayapán. Sanders (1960:230) stated that it is impossible to distinguish Tulum Red and Mayapán Red sherds. Incised decorations in the form of the *ilhuitl* glyph appear on pottery from Mayapán, Tulum, Lamanai, Tipuj, Zacpetén, and Ixlú. While Chase, Sanders, and Miller discuss the resemblances of pottery to archaeological sites on the east coast, they all agree that the pottery at their respective sites was most likely the result of local potters who had contact with the community of Mayapán.

Postclassic ceramics from Mayapán (Brainerd 1958; Smith 1971) forms the basis from which many archaeologists compare their pottery collections to examine interregional interactions and theories of migrations of portions of the Mayapán population. Smith (1971) provided a detailed description of the pottery from Mayapán with additional information from Chich'en Itza, Uxmal, and Kabah. Based on the types of pottery, the extent of its appearance in archaeological contexts throughout the region, and temporal distinctions, Smith (1971:167) stated that Cehpech (A.D. 800-1000) pottery, dominated by Puuc and Fine Orange wares, was the most widespread ceramic complex and was produced at many centers of manufacture. Pottery from this group has connections to Tepeu 3 pottery from Uaxactún because of the presence of modeled-carved techniques, basal z-angles, and fluting (Smith 1971:253). However, only 1.5 percent of the sherds from Mayapán represent this ceramic complex (Smith 1971:169). Although Sotuta (A.D. 1000-1200) pottery also occurs sparingly at Mayapán, it is abundant at Chich'en Itza. New forms, such as the grater bowl and the tripod plate are introduced during this time period. The pottery of the Sotuta complex may have been produced at Chich'en Itza due to the uniformity in pastes, slips, and decoration. Sotuta censers are found at Santa Rita (Chase 1985), Cerros (Walker 1990), and Becan (Ball 1977). On the other hand, Smith (1971:202-203, 254) stated that the Hocaba (A.D. 1200-1300) ceramic complex may have been produced locally by a new population base of unknown origins (but not Itzá) because it lacks continuity as seen in the Sotuta ceramic complex. Hocaba pottery is most abundant at Mayapán. The final ceramic complex at Mayapán, Tases (A.D. 1300-1450), also occurs almost exclusively at Mayapán (Smith 1971:206). The Tases ceramic complex is dominated by Chen Mul effigy censers in addition to many redwares and unslipped wares of the Hocaba ceramic complex. These wares are also locally produced. Smith (1971: 254-255) noted the similarities of Hocaba and Tases ceramic complex pottery to that of Postclassic pottery present in Petén, especially Topoxté, as well as Chompoton and the east coast of Yucatán. Current excavations at Mayapán may reveal more information concerning the Postclassic pottery and the extent of interregional connections.

Brainerd (1958) provided a comprehensive study of pottery from Chich'en Itza. His analysis provided a ceramic sequence of which the Postclassic period is signified by the Mexican stage that is divided into Early, Middle, and Late substages. Brainerd (1958:34-35) stated that Early Mexican pottery is the result of Mexican or Toltec populations who introduced X Fine Orange pottery. The Middle Mexican substage is distinguished by the presence of Coarse Slateware that is most abundant at Chich'en Itza and occurs sporadically at Mayapán (Brainerd 1958:95). Finally, the Late Mexican substage pottery is dominated by Maya-like redwares with a widespread distribution (Brainerd 1958:95). While Brainerd outlined the Postclassic pottery of the Early, Middle, and Late Mexican stages, much debate occurs with respect to Chich'en Itza pottery chronology because of the mixture of Cehpech and Sotuta ceramics (Chung and Morales 2000; Lincoln 1986; Ochoa-Winemiller 2000).

Current archaeological projects in Yucatán, Belize, and Guatemala are adding information as to ceramic complexes, settlement history, and interregional contacts. Unfortunately, many of the results from these projects are only now being analyzed and interpreted and as such there is a paucity of published material from which to draw comparisons.

Paxcamán Ceramic Group

Name: Paxcamán Red: Paxcamán Red

Frequency: This description is based on 59 sherds: 22 sherds from Ch'ich'; 10 sherds from Ixlú; 1 sherd from Zacpetén; and 26 sherds from Tipuj. Paxcamán Red: Paxcamán Red type represents 32 percent of the Paxcamán ceramic group sherds used in this study and 11 percent of the total sherds used in this study.

Ware: Volador Dull-Slipped ware.

Established: R.E.W. Adams and Trik (1961:125-127) defined and illustrated this type based on collections from Tikal. Descriptions have been elaborated by Chase (1983, 1985), Cowgill (1963), and Rice (1980, 1984, 1985, 1987a).

Principal Identifying modes: 1) Dark gray to light brown pastes; 2) Red to red-orange slips; 3) Bowls, tripod dishes, jars, grater bowls, and flanged tripod dishes and bowls.

Types of analysis: "Low-tech" (59 sherds); petrographic (27 sherds); x-ray diffraction (1 sherd); EDS and SEM and strong-acid extraction ICPS (8 sherds).

Pastes and firing: The majority of sherds of this type have light to dark gray (10YR 5/2, 2.5YR 6/1) pastes with snail inclusions, while reddish-brown (5YR 5/6) and tan (10YR 6/3) paste occur less frequently. Paste colors are highly variable at all of the sites, but tan pastes typically co-occur with Terminal Classic and Early Postclassic ceramic lots. Pastes from Ch'ich' are dark gray, light gray, and brown. Pastes from Zacpetén vary considerably and range from dark gray to light gray to reddish brown and to brown. The brown paste color occurs most frequently in sherds from Structure 719 (a residence).

While overfired sherds occur at all sites, Ixlú had the highest frequency of overfired sherds. The majority of the sherds from all locations are estimated to have been fired to 500°C-650°C, with four estimated to have been fired to 300°C-400°C. Core hardness ranges from 2-3 on the Mohs' scale.

Paxcamán Red pastes have euhedral and polycrystalline calcite, quartz, shell, and hematite inclusions, and some sherds also include biotite, chert, and chalcedony minerals. Although the reddish-brown pastes have snail inclusions, they are not present in the same quantities as in the gray paste sherds. Tan paste sherds generally do not have snail inclusion, but may have volcanic-ash-tempering. The amount of shell in the clay paste also varies at Zacpetén. Gray pastes tend to have a higher frequency of shell than brown pastes. Some medium to dark gray paste sherds from Tipuj have a sulfur smell that resembles those from Macanché Island. Lake Macanché's water has a high magnesium sulfate content (Deevey et al. 1980:410) which may source pottery made at the site of Macanché Island.

Surface treatment and decoration: Paxcamán Red sherds have a red to red-orange (10R 4/6 to 2.5YR 4/8) monochrome slip. Some of the slips have a low luster, but the majority have a matte finish. Low luster slips are relatively thicker (.625 mm) and have a higher Mohs' hardness indication (3-4), whereas the matte finish slips are thinner (.25 mm), usually eroded, and have a lower hardness indicator (2-3). Erosion commonly occurs in this collection.

Slips at the four sites exhibit the same variablity as seen in the paste colors. Ch'ich' slips are very eroded and thin. However, the three vessels near the interior shrine of Structure 188 have a thicker, well preserved slip. All of the tripod dish sherds have black fireclouding along the wall/base juncture. Zacpetén tends to have more dark, almost purplish, red slips than the other sites, and Ixlú has more orange-red slips. The orange-red color comes from a highly oxidized layer just below the slip. Because the slip is thin, the oxidized layer adds a tint to the color of the slip. Sherds from Zacpetén and Ixlú have black fireclouding. Tipuj slips are dark red, but not to the extent of having a purple tint similar to Zacpetén; they are thick and well preserved. While black fireclouds do occur, at Tipuj, tan fireclouds are much more prevalent.

Forms and dimensions: Paxcamán Red forms include most of the Postclassic forms: tripod dishes, bowls, collared bowls, flanged tripod plates, and jars. Of the 48 rims of this type included in this study, 24 rims are tripod dishes, 5 rims are bowls, 3 rims are flanged tripod plates, 6 rims are collared bowls, and 10 rims are jars. The most common forms are tripod dishes and narrow neck jars. However, two flanged collared bowls were found at Ch'ich' and Zacpetén. Tripod dishes and flanged dishes have trumpet and scroll supports.

Tripod dish rim diameters range from 20-34 cm ($\bar{x}$=25.8 cm). Direct rims are either rounded or interiorly beveled. Bowl rim diameters range from 9-30 cm ($\bar{x}$=21 cm) and their direct rims are also either rounded or interiorly beveled. Flanged tripod plate diameters range from 26-30 cm ($\bar{x}$=28 cm). Direct rims are rounded or interiorly beveled. Collared bowl rim diameters range from 8-36 cm ($\bar{x}$=23 cm). The direct rims are rounded, pointed, and interiorly beveled. Jar rim diameters range from 10-38 cm ($\bar{x}$=22.5 cm) and their direct rims are rounded. Ixlú's Structure 2041 has the largest jar forms with very thick folded rims (1-1.2 cm) and large diameters (34-42 cm).

Wall thickness ranges from 4.56-9.82 mm. Tripod dish wall thickness ranges from 4.89-8.29 mm ($\bar{x}$=6.62 mm), flanged tripod dish wall thickness ranges from 5.18-8.51 mm ($\bar{x}$=6.73 mm), jar wall thickness ranges from 4.56-8.26 mm ($\bar{x}$=6.02 mm), collared jar wall thickness ranges from 4.74-9.82 mm ($\bar{x}$=6.72 mm), and bowl wall thickness ranges from 4.88-7.89 mm ($\bar{x}$=6.65 mm).

Illustrations: Figures 8, 9, 10

Intrasite references: Paxcamán Red: Paxcamán Variety occurs at all of the sites in the study and in all excavated Postclassic structures.

Intersite references: Paxcamán Red vessels are ubiquitous at all Petén lake sites. However, Topoxté Island has the lowest quantity of Paxcamán Red sherds of any Postclassic in the Petén lakes region (Rice 1979).

My study of Paxcamán Red pastes from Tayasal shows that pastes from this site

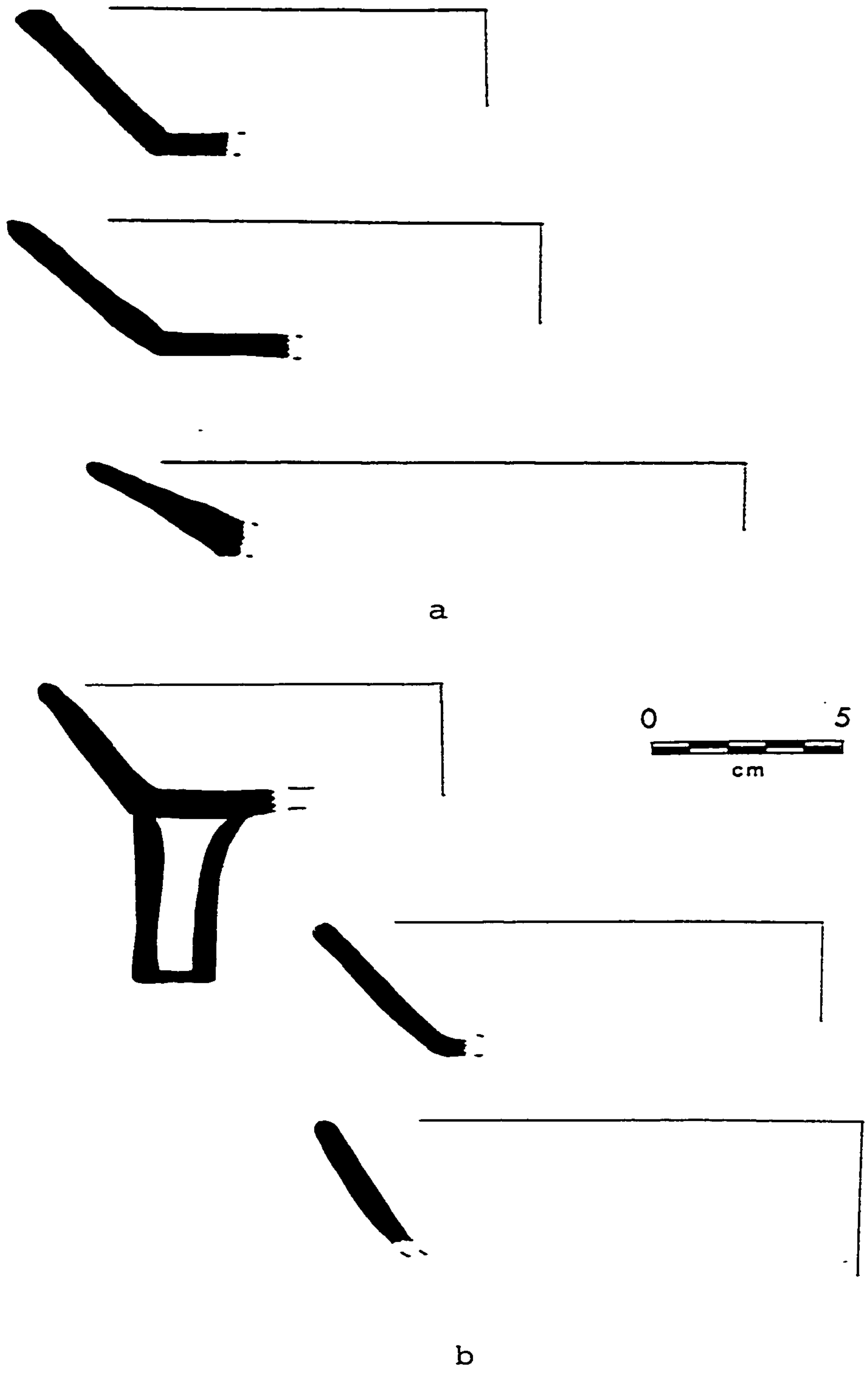


Figure 8: Paxcamán Red Tripod Plate Profiles from Tipuj (a) and Ch'ich' (b).

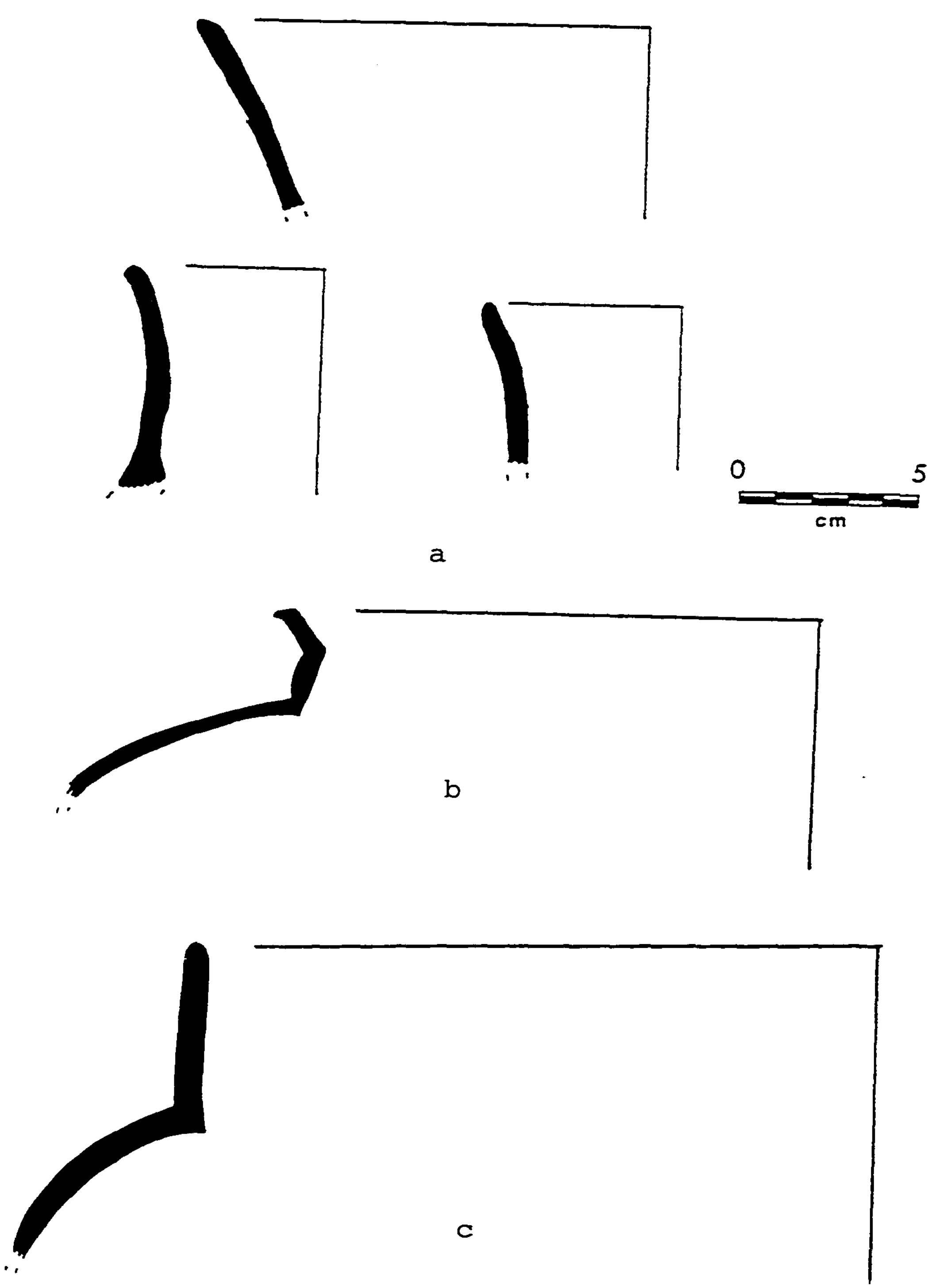


Figure 9: Paxcamán Red Jar Rim Profiles from Tipuj (a), Ixlú (b), and Ch'ich' (c).

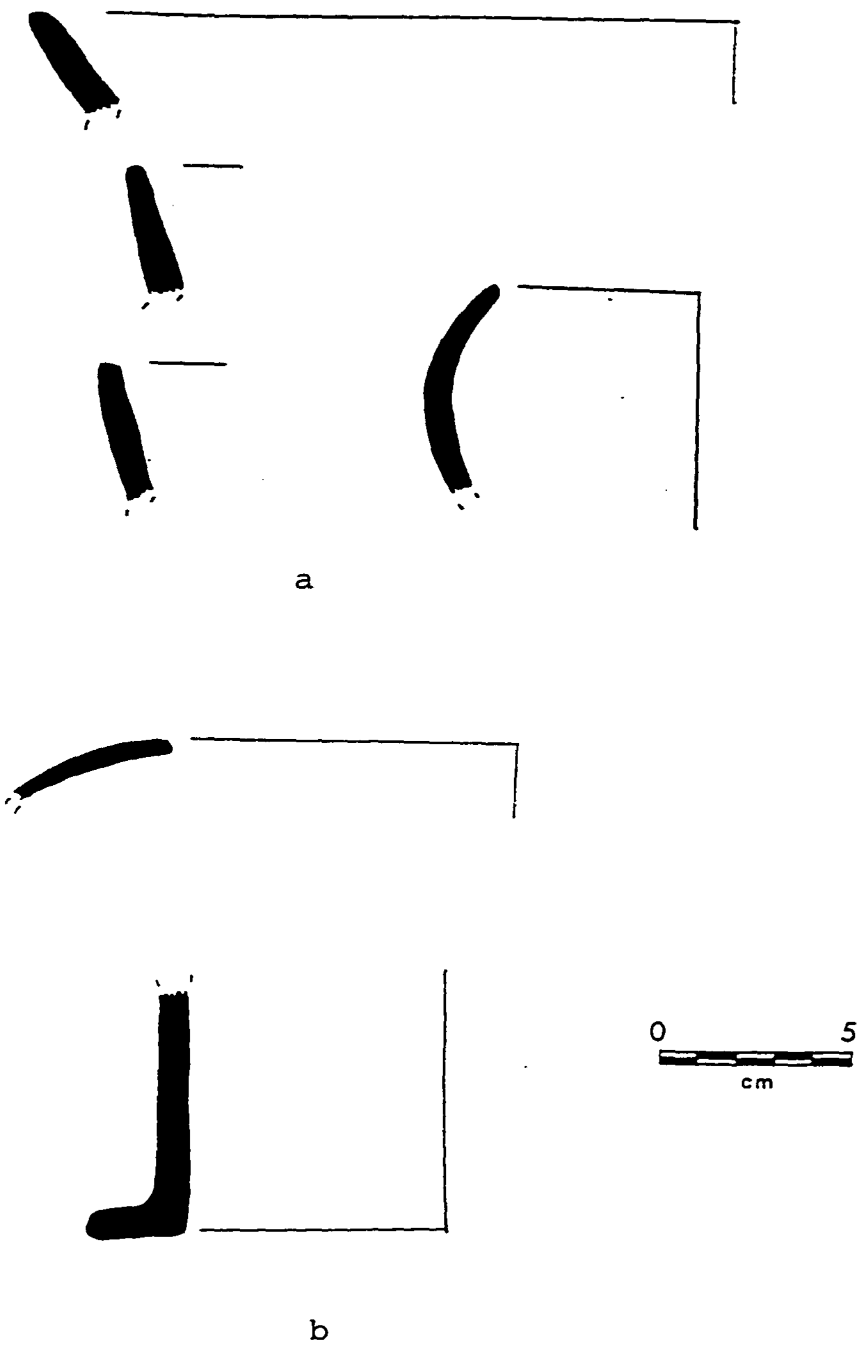


Figure 10: Paxcamán Red Bowl, Collared Jar, and Miscellaneous Rim Profiles from Tipuj (a) and Ch'ich' (b).

are predominantly reddish brown, but gray pastes do exist. The slips have a low luster, no evidence of a secondary or over slip, and black fireclouding on vessel walls. Most of the sherds from Tayasal represent narrow neck jars; however, a flanged bowl/dish has a left stepped flange.

My observations of the Paxcamán Red sherds from Macanché Island (currently at the Florida Museum of Natural History) suggest the same paste and slip variability as seen at Zacpetén. The paste colors range from tan to reddish brown to gray with a wide range of inclusion percentages. Darker colored pastes have an oxidized layer under the slip. Freshly broken sherds have a distinctive sulfur smell. Slip colors vary as much as paste colors. Some slip colors are slightly darker than Trapeche Pink slips while others are a rich deep red. Black fireclouding is common on matte to low luster finishes. Forms include tripod dishes, bowls, collared jars, narrow neck jars, and restricted orifice bowls. Tripod dishes at Macanché Island are smaller in diameter (19-23 cm) than those found at most other Petén Postclassic sites (Rice 1987a:118). All other form measurements are within the range seen at other Petén sites.

Canté Island, one of the islands in Lake Yaxhá, has the only occurrence of Paxcamán Red pottery at the Topoxté site (Rice 1979:64-66). Paste colors range from gray to brown and the amount of shell inclusions also ranges from abundant to rare, respectively. The paste variety resembles that of other sites in the Petén lakes region. Slip colors are generally red (2.5YR 4/8) and have a matte finish (Rice 1979:66). Forms include jars, tripod dishes, and collared bowls.

Cowgill's excavations at Flores Island produced many Paxcamán Red sherds. Like those from Zacpetén, Flores Island slips tend to be darker and have a low luster or matte finish. Gray snail inclusion pastes predominate; however, Cowgill (1963:89) notes the presence of brown paste sherds. Forms and vessel proportions resemble those from the Petén lakes region.

Paxcamán Red vessels have been located at Barton Ramie (Gifford 1976:294-297). The paste and slip colors and degree and kind of inclusions vary as much as any other site with the Petén lakes region. Bowls are the most common form at Barton Ramie, but tripod dishes and jars also occur. Bowl and plate diameters are relatively large (32-40 cm) compared to Petén sites.

Foais (1996:721-724) notes that Paxcamán Red sherds were found in excavations at Punta de Chimino. Forms include a "jar with outcurved restricted neck, sharp collar, thick body, and flat base," bowls, and a cylindrical support (Foais 1996:722). Slip and paste color resemble those described above. Black fireclouds occur.

Valdez (1987:224) notes the presence of Paxcamán Red tripod dishes and short and medium neck jars at Colhá. According to Figure 56a (Valdez 1987:213), the tripod dish has a deep sagging bottom with short supports with two circular vents. This form resembles those from Mayapán (Smith 1971).

Red slipped vessels (Mayapán Red, Chichen Red, and Tulum Red) also occur in northern Yucatan. Tripod dishes, jars, and bowls are the most common forms.

Name: Paxcamán Red: Escalinata Variety

Frequency: This description is based on 5 sherds: 3 from Ch'ich' and 2 from Tipuj. Paxcamán Red: Escalinata Variety represents three percent of the Paxcamán ceramic group and .90 percentage of sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on ceramic collections from Ch'ich' and Tipuj.

Types of analysis: "Low-tech" (5 sherds); petrographic (2 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Black rim on a red slipped vessel; 2) Gray, snail inclusion pastes; 2) Red to red-orange slips; 3) Tripod dishes, jars, and grater bowls.

Paste and firing: Pastes are light gray (10YR 5/2) to grayish brown (2.5Y 5/2). Snail inclusions are present, but not in high quantities. Subhedral and euhedral calcite, anhedral quartz, and hematite also occur in the clay matrix. The sherds are estimated to have been fired between 550-600°C with a paste hardness of 3.

Surface treatment and decoration: Paxcamán Red: Escalinata Variety sherds have a blackened rim. The blackened rim appears to be the result of differential access to oxygen during firing rather than an applied black pigment. The remaining body of the sherds are slipped red to red-orange as described above. Tan fireclouds occur on sherds from Tipuj. Slips from this variety are generally low luster, .375 mm thick, and have a Mohs' hardness of 2-3.

Forms and dimensions: Tripod dishes and collared jars have blackened rims. Tripod dish rim diameters range from 20-26cm ($\bar{x}$=23 cm) and the collared jar has a rim diameter of 36 cm. The direct rims of both forms have rounded and interiorly beveled lip shapes. Tripod dish wall thickness ranges from 6.61-8.16 mm ($\bar{x}$=7.34 cm) and the collared jar wall thickness is 8.25 mm. Trumpet and scroll supports occur on tripod dishes.

Illustrations: Figure 11

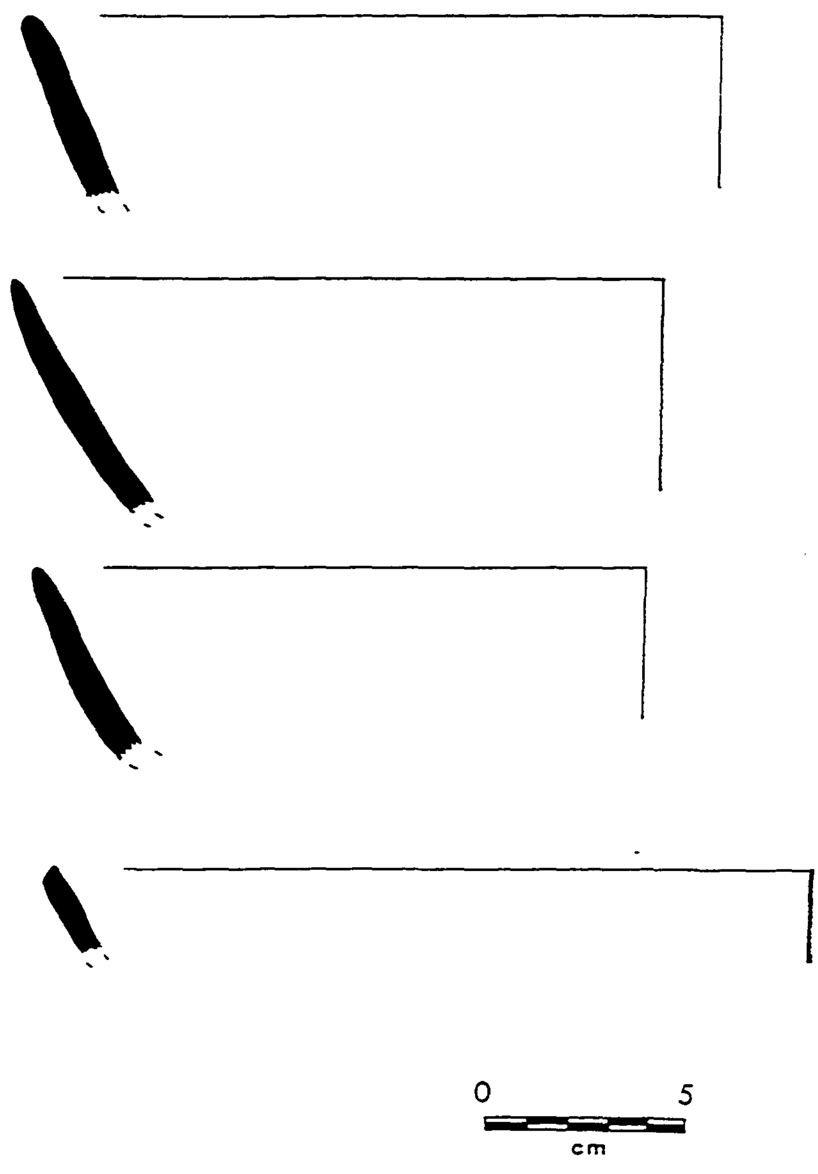


Figure 11: Paxcamán Red: Escalinata Variety Rim Profiles from Ch'ich'.

Intrasite references: While this study only includes Paxcamán Red: Escalinata Variety sherds from Ch'ich' and Tipuj, sherds of this variety also exist at Ixlú and Zacpetén. Twenty-three tripod dish sherds from Ixlú have black rims. While the majority of the pastes are gray, a significant quantity are also brown in color. Rim diameters range from 22-28 cm with the majority of the diameters between 22 and 24 cm. The rims occur in all of the Postclassic structures at Ixlú. Zacpetén blackened rims (n=18) occur in six structures: 606 (open hall), 719 (residence), 764 (temple), 758 (residence), 767 (open hall), and 1001 (plaza fill). The rim diameters range from 16-30 cm with the majority between 26-30 cm. Unlike Ixlú, gray pastes predominate at Zacpetén.

Intersite references: Black rimmed sherds similar to those described above occur at Tayasal and Macanché Island. The blackened rims resemble those of the Late Classic polychrome types; however, unlike the Late Classic polychrome types, most rims do not appear to be intentionally painted black. Instead, the black rims appear to be a result of differential access to oxygen during the firing process.

Name: Ixpop Polychrome: Ixpop Variety

Frequency: Sixty-five sherds represent this type: 15 from Ch'ich'; 22 from Ixlú; 20 from Zacpetén; and 8 from Tipuj. Ixpop Polychrome: Ixpop Variety represents 35 percent of the Paxcamán ceramic group and 12 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: R.E.W. Adams and Trik (1961:125-127) first described this type from the Tikal collection.

Types of analysis: "Low-tech" (65 sherds); petrographic (29 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (7 sherds).

Principal identifying modes: 1) Banded black line decoration; 2) Red to red-orange exterior and rim slip; 3) Tripod dishes, bowls, and jars.

Paste and firing: Ixpop Polychrome: Ixpop Variety pastes are typical Paxcamán ceramic group snail inclusion pastes. Paste colors range from dark grayish brown (2.5Y 4/2) to light brown (7.5YR 6/4) with gray coring present in 30 sherds. At Ixlú, pastes are also reddish brown and a small number of tan ashy pastes also occur. Estimated firing temperatures range from 550-700°C for brown pastes and from 300-500°C for sherds with gray cores. Paste hardness ranges from 2-3. Sherds from Tipuj have a distinctive sulfur smell when broken. This also occurs at Macanché Island.

Euhedral and subhedral calcite, quartz, chert, biotite, and shell appear in the clay matrix of Ixpop Polychrome.

Surface treatment and decoration: Slips of this type are red (10R 4/6) to red-orange (2.5YR 4/6) with low luster and matte finishes. Preservation of the slip is generally good; however, some sherds exhibit heavy erosion. Some exterior slips appear to be double-slipped--a red slip covered by a thin, semi-translucent tan/whitish over-slip. These sherds have a low luster, are better preserved than other Ixpop Polychrome sherds, and occur most commonly at Zacpetén. Slip thickness ranges from .625-.325 mm and slip hardness ranges on the Mohs' scale from 2-4.

Ixpop Polychrome: Ixpop Variety is defined by its black painted decoration that is usually on the interior of dishes and bowls, on the interior rim of collared jars, and on the exterior surface of jars. Typical Ixpop Polychrome decorative panels are marked by a double circumferential band toward the rim and a single circumferential band along the bottom of the panel. Double banding on the bottom of the decorative panel also appears; however, it is rare. One jar shoulder sherd has triple banding. The black bands are painted over a light tan to light orange undercoat. The decoration is painted next, and finally, the red slip is applied to the exterior surface, the rim, and the base. Slips are not carefully applied to the rim which results in the first top band and the bottom band being covered by the red slip.

Most decoration panels are heavily eroded and decorative motifs and elements are difficult to discern. When the decorative panels are better preserved, the typical decoration is a hook or plumelike element encircled by curved lines or parentheses. In addition to these two elements, stepped pyramids, circles with connecting lines, possible reptilian motifs, and variations of the Lamat glyph appear in the decoration panel.

Forms and dimensions: This sample of Ixpop Polychrome pottery contains jars (n=1), tripod dishes (n=49), collared jars (n=4), and hemispherical bowls (n=1). Tripod dishes have trumpet and scroll supports. The jar direct rim with a rounded lip has an 18 cm diameter and a wall thickness of 6.51 mm. Tripod dish rim diameters range from 20-34 cm ($\bar{x}$=26.24) with a wall thickness range of 5.06-9.86 mm ($\bar{x}$=7.05mm). All of the tripod rims are direct, and lip shapes are round, interiorly beveled, square, and pointed. Rounded and interiorly beveled direct rims are the most common lip shape among tripod dish forms. Collared jar rim diameters range from 6-32 cm ($\bar{x}$=22.5 cm). The smallest collared jar rim diameter belongs to a miniature vessel. Collared jars have outflaring necks with wall thickness varying from 4.56-8.89 mm ($\bar{x}$=6.28 mm). The hemispherical bowl has a rim diameter of 14 cm, a wall thickness of 4.72 mm, and a rounded direct rim.

Tripod dishes from Ch'ich' have only black line decoration. Ixlú Ixpop Polychrome sherds have shorter (lower) decoration areas and walls than most of the other forms from Ch'ich', Zacpetén, and Tipuj. Sherds from Structure 719 at Zacpetén most closely resemble the decoration panel size that occurs at Ixlú.

Illustrations: Figure 12

Intrasite references: Ixpop Polychrome sherds occur only in the following structures: 2006 (domestic), 2017 (open hall), 2018 (open hall), 2020 (oratory), 2022 (open hall), 2023 (temple), and 2041. All sherds are from the second (collapse) and third (floor) levels. One sherd comes from provenience 6d2 of Structure 2023 which is the same provenience as the linear skull cache (personal observation).

Zacpetén has the highest number of Ixpop Polychrome sherds. Only two structures (720 and 607, both statue shrines) lack Ixpop sherds. The majority of sherds come from the first three levels; however, some sherds come from level 8 of Structure 719. Pugh (personal communication, 2000) states that this level may represent a deposit of ritual wares.

Ixpop Polychrome sherds occur at Structures 1 (oratorio), 2 (temple), and 3 (open hall)at Tipuj. All sherds except one are from the first three levels. The remaining sherd was excavated from below floor 2 of Structure 2 (temple).

Intersite references: Ixpop Polychrome occurs at many other sites the Petén lakes region: Tikal, Tayasal, Macanché Island, Flores Island and Paxté and Canté Island and has correlates in Pek Polychrome, Pastel Polychrome, and Mul Polychrome. A common set of decorative elements that include mat motifs, plumes, circles, parentheses, and hooks appear in most if not all of the black line decorated types in the Petén lakes region.

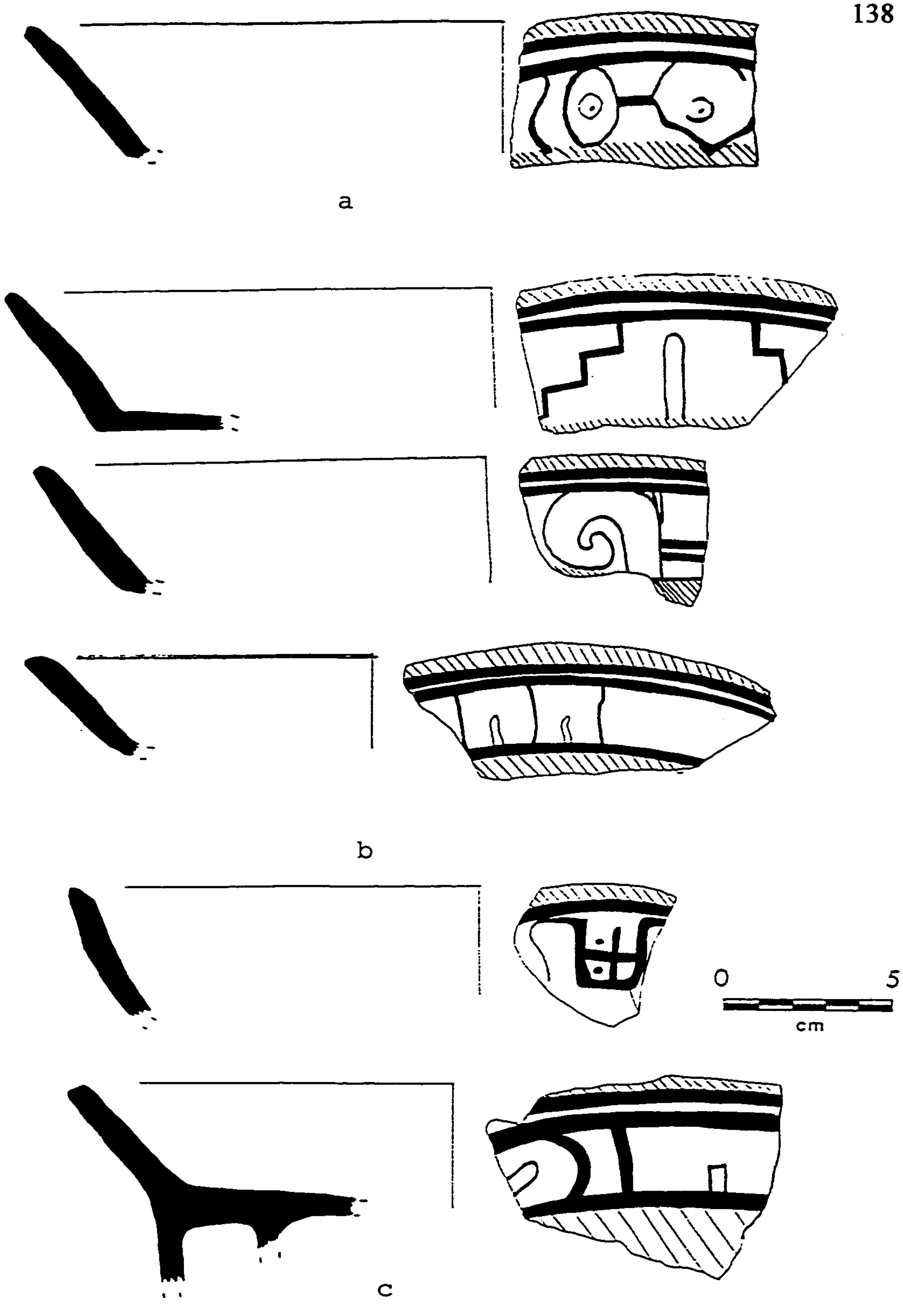


Figure 12: Ixpop Polychrome: Ixpop Variety Rim Profiles from Tipuj (a), Zacpetén (b), and Ixlú (c).

A tripod dish that resembles those found at Ch'ich', Flores Island, Ixlú, and Zacpetén was discovered in an intrusive burial at Temple I at Tikal. Adams and Trik (1961:126) state that the Ixpop Polychrome tripod dish with trumpet supports has a repeated *Eznab* day glyph.

My examination of Ixpop Polychrome sherds from Tayasal indicates that they are poorly preserved. The one decoration that remains has two top and one bottom circumferential black bands. The bands demark a decoration area that has a primary slip on top of which is painted a curvilinear line and small circle. All examples of Ixpop polychrome are tripod dish forms with pastes are similar to those described above.

My observations of Macanché Island sherds suggest that they also similar to those described above. The decoration area has a tan primary slip and is delineated by one or two top and bottom circumferential black bands. Exterior slips may be the result of a double slip due to their mottled appearance. Restricted orifice bowls have a series of three circumferential bands. Some decoration areas are paneled as is evident by two vertical lines and a repeating pattern. Reptilian motifs are more common at Macanché Island than at other sites in the Petén lakes region (Rice 1987a:125-130). In all other respects, decorative elements are similar to those described above.

Ixpop Polychrome sherds have been excavated at Canté Island (Rice 1979:66-68) and in 1998 excavations at Paxté Island. Sherds from Canté (n=3) are eroded and identified by traces of black bands on a tripod dish, characteristic red exterior slip, and snail inclusion paste. Excavations at Paxté Island in 1998 yielded three tripod dish sherds that are smaller in height and diameter than others from the Petén lakes region. Unfortunately, the decoration is eroded, but all other characteristics are similar to those described previously.

Cowgill (1963:91) states that Ixpop Polychrome vessels resemble those of other sites in the Petén lakes region except most of the dishes have trumpet supports. Decoration on the forms consists of a brownish black paint. Two top and one bottom circumferential bands delineate decoration areas. Decoration demonstrate vertical reflection symmetry and motifs include birds, Etznab and Men day glyphs, and hooks (Cowgill 1963:107-108).

Outside of the Petén lakes region, Ixpop Polychrome sherds are also located at Barton Ramie (Gifford 1976:298-300), and Punta de Chimino (Foais 1996:727-728). At Barton Ramie, tripod plates with rim diameters 20 to 32 cm bare black line decoration. The range of slip color and inclusions is similar to that of Zacpetén. Red slips are well preserved, have a "waxy" finish, and occasionally have black fireclouds (Gifford 1976:299). Stylized RE glyphs, Eznab day glyphs, and other curls occur in groups of two on a light yellow-brown primary slip (Gifford 1976:Figure 196).

One tripod dish sherd from Punta de Chimino has a thick red glossy exterior slip and an eroded interior surface (Foais 1996:727). Evidence of a black circumferential band exists on the interior surface below the rim. The paste is reddish brown and has euhedral calcite inclusions.

In addition to Barton Ramie, black painted decoration that is similar to Ixpop Polychrome occurs in northern Yucatán as Mama Red: Black-on-unslipped Variety Polychrome (Mayapán Red ware) (Smith 1971:22-23).

Name: Sacá Polychrome: Sacá Variety

Frequency: This description is based on 14 sherds: 12 from Zacpetén and 2 from Ixlú. Sacá Polychrome: Sacá Variety accounts for eight percent of the Paxcamán ceramic group and 2.5 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Sacá Polychrome: Sacá Variety was first described by Cowgill (1963:237-243) based on ceramic collections from Flores Island.

Types of analysis: "Low-tech" (14 sherds); petrographic (3 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal identifying modes: 1) Red and black painted decorations; 2) Red to reddish yellow exterior slip; 3) Snail inclusion paste; 4) Tripod dishes, flanged collared jars, and bowl forms.

Paste and firing: Sacá Polychrome pastes range from light brown (7.5YR 6/4) to light gray (5Y 7/1). Although most of the sample is oxidized throughout, three sherds exhibit dark coring. Inclusions in the paste consist of shell, subhedral and euhedral calcite, anhedral calcite, chert, biotite, and quartz. The pastes have a Mohs' hardness of 3 and are estimated to have been fired to 550-600°C.

Surface treatment and decoration: Slips are red (10R 4/6) to reddish yellow (5YR 7/8) and decorations are painted in red (10R 4/6-5R 4/4) and black (2.5YR 3/1-5YR 3/1). The decorations appear to be painted on a very faint primary slip. Tripod dish decorations appear on the interior while decorations on jars and bowls appear on the exterior. Like Ixpop Polychrome decorations, Sacá Polychrome: Sacá Variety decorations are banded. However, instead of two black lines at the top, a red line is between the two black bands.

The bottom of the decoration is marked by a single black line. Decorative elements appear in decoration panels below the banding that are marked by vertical black and/or red lines. Decorative elements include hooks, plumes, embedded triangles, and other eroded geometric shapes. Two collared bowls have flanges. The flanges are a single step to the right and are alternately painted red and black. Red (7.5R 3/6) slip occurs below the flanges. Slips are approximately .375 mm thick.

Forms and dimensions: Sacá Polychrome: Sacá Variety includes four forms in this sample: tripod dishes (n=4), flanged collared jars (n=2), and restricted orifice bowls (n=1). Tripod dish rim diameters range from 24-30 cm ($\bar{x}$=28 cm) with wall thickness varying from 4.93-8.0 mm ($\bar{x}$=6.52 mm). The direct rims have either rounded (most common), interiorly beveled, or square lip shapes. Flanged collared jar rim diameters range from 16-20 cm ($\bar{x}$=18cm) with wall thicknesses from 4.84-5.02 mm (mean=4.93 mm). One direct rim has an interiorly beveled lip shape. The second collared jar rim is exteriorly thickened with a rounded lip shape. Flanges are stepped to the left. The first steps average 11.5 mm and the second steps average 8.08 mm in height. The restricted orifice bowl has a rim diameter of 40 cm and a wall thickness of 7.8 mm. Its direct rim has a square lip shape.

Illustrations: Figure 13

Intrasite references: The two Ixlú sherds were located in Structure 2023 (temple) at levels 2 (collapse) and 4 (below the floor).

Sacá Polychrome sherds from Zacpetén were located in the following structures: 719 (residence), 720 (statue shrine), 721 (temple), 732 (residence), 748 (unknown), 758 (residence), 764 (temple), 765 (raised shrine), 766 (statue shrine), and 767 (open hall).

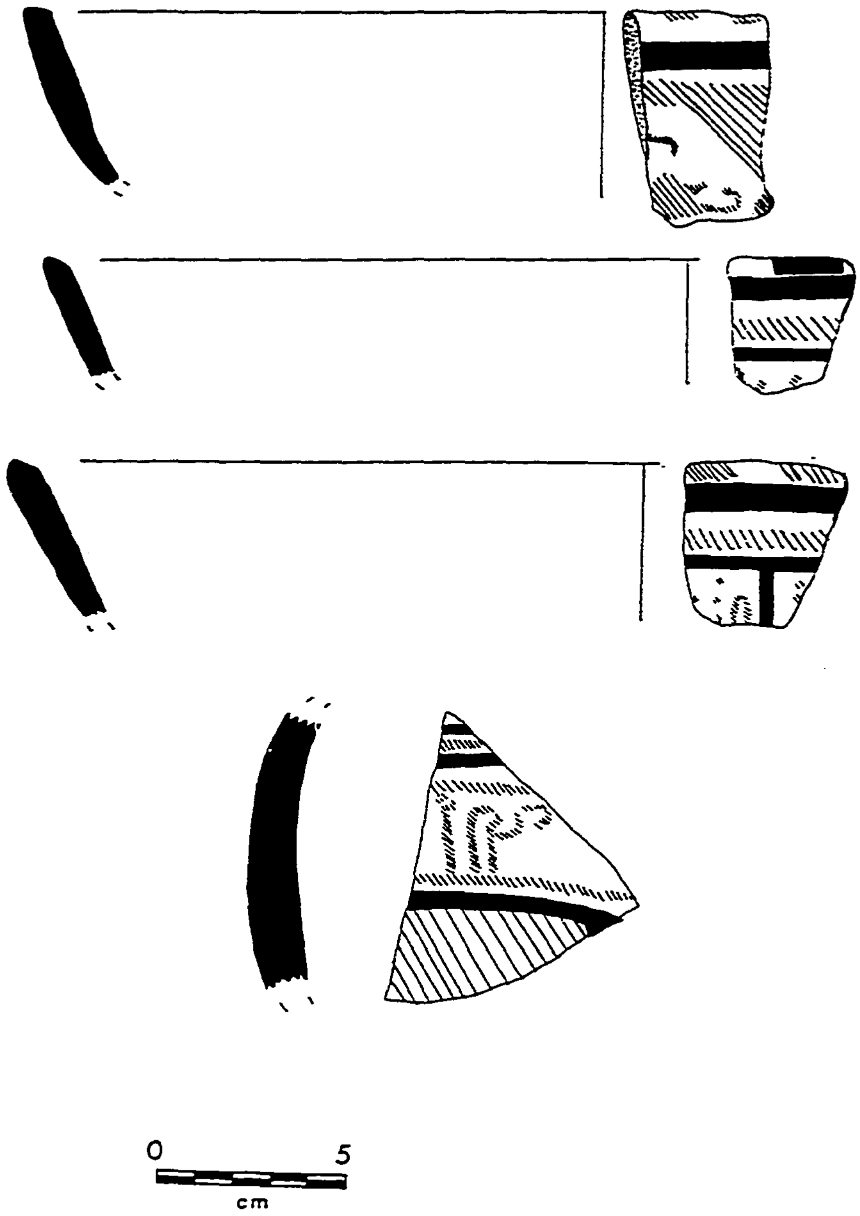


Figure 13: Sacá Polychrome: Sacá Variety Rim Profiles from Zacpetén.

The best preserved sherds come from Structures 719, 732, 748, and 766 and most of the Sacá Polychrome sherds were located in Structure 732. All but 2 sherds come the first three levels. One sherd from Structure 719 comes from level 5a in a test pit and the other sherd comes from level 4 of Structure 719.

Intersite references: Sacá Polychrome: Sacá Variety sherd decorations parallel those of Graciela Polychrome, Dolorido Polychrome, and Canté Polychrome in the Petén lakes area. Small quantities of Sacá Polychrome: Sacá Variety sherds were also found at Tayasal, Macanché Island, and Flores Island.

I examined the two jar sherds from Tayasal. They have reddish brown and light gray pastes with red and black decorations that are painted on a faint primary slip. Two red and black alternating top bands and a single red bottom band delineate a black decoration. The eroded curvilinear line decoration may be paneled by two vertical black lines.

Fourteen Sacá Polychrome: Sacá Variety sherds were excavated from the top of the Postclassic mound on Macanché Island. My examination of these sherds suggests a similarity to other Sacá Polychrome sherds with respect to decoration areas. The decorations are placed on a primary slip with a top series of bands consists of one red band between two black bands. Bands at the basal break are not detectable due to the fragmentary nature of the sherds. The red band and decoration paint is darker (10R 3/6, 7.5R 4/4) than the exterior slip and has a low luster. Decorative elements are nested chevrons and curved lines.

Cowgill (1963:110-111) describes 14 Sacá Polychrome: Sacá Variety sherds from Flores Island. Drawings of the sherds indicate a triangular decoration that occurs on pottery from Zacpetén (Cowgill 1963:Figure 5t).

Outside of the Petén lakes area, red and black painted decoration occurs at Punta de Chimino (Foais 1996:728-729) and in northern Yucatán. The probable tripod dish sherd from Punta Chimino has a glossy red exterior slip. The interior surface decoration is delineated by a two circumferential bands–one red and one black–and the decorative elements are eroded. In northern Yucatán during the Tases period, red and black painted decoration occurs on Pele Polychrome at Mayapán, Chichen Itzá, Dzibilchultun, Tecoh, Champoton, and Panabchen (Smith 1971:22). In Naco, Honduras small quantities of black and red decorated pottery occur after A.D. 1450 (Wonderley 1981:191) as Hidaldo, Vagando, and Posas Polychrome types.

Name: Sacá Polychrome: Rasgo Variety

Frequency: One sherd from Zacpetén. Sacá Polychrome: Rasgo Variety represents one percent of the Paxcamán ceramic group and .18 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal identifying modes: 1) Black and red decoration on interior and exterior surfaces; 2) Red to red-orange slip; 3) Snail inclusion paste; 4) Collared jar form.

Paste and firing: The paste is a yellowish color (10YR 7/6) with a gray core (2.5Y 5/1). Small, anhedral calcite dominates the clay matrix with a few snail shell, quartz, and hematite inclusions. The sherd is estimated to have been fired to 600°C, is incompletely oxidized, and has a core Mohs' hardness of 3.

Surface treatment and decoration: The exterior of the vessel is slipped red below the flanges and a thin pink (7.5YR 7/4) undercoat appears under the painted decoration. Two decoration zones appear on the vessel: one on the jar neck and one on the jar body. The jar neck is banded by two black (7.5YR 3/1) lines along the lip and a single black band at the neck/shoulder junction. A series of embedded triangles appears between the black bands.

The second decorative zone, on the body of the jar, is delineated by single circumferential red (10R 4/8) band and is paneled by two red vertical lines. The decorations are red or black and alternate from one panel to the next. Unfortunately, the decorative elements are indiscernible because of erosion.

The flanges consist of two steps that face right and are painted red.

The interior of the vessel has decoration on the vessel neck and is slipped yellowish brown (10YR 5/8) on the interior. The decoration area is marked by a single circumferential band on the top and bottom and the decoration area is paneled. The bands and the decoration are red (10R 4/8). Again, the decorative elements are almost completely eroded.

The slip has a thickness of .625 mm and all slips and painted decorations have a Mohs' hardness of 3.

Form and dimension: The flanged collared jar has a diameter of 16 cm and a wall thickness of 4.69 mm. The two flanges step to the right and the first step is 6.39 mm high and the second is 7.95 mm high. The direct rim is interiorly beveled.

Illustration: Figure 14

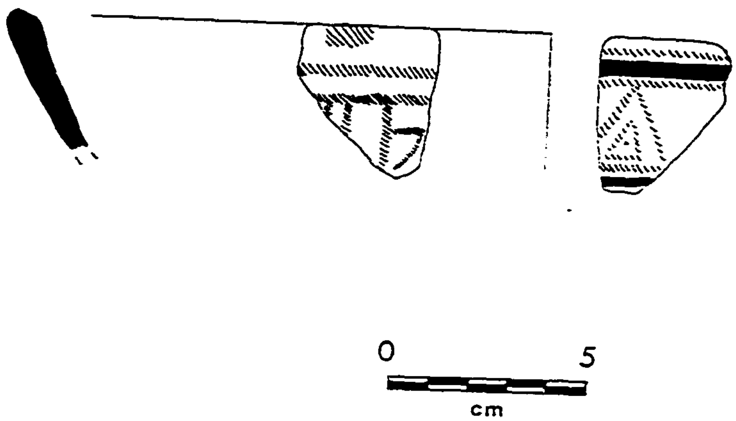


Figure 14: Sacá Polychrome: Rasgo Variety Rim Profile from Zacpetén.

Intrasite reference: This sherd was found in Structure 720 (statue shrine) at level 2 (collapse) at Zacpetén. An additional sherd of the same type, but not included in this study was found in nearby Structure 719 (residence). This sherd is either a tripod plate or a collared jar. No other sherds of this type have been found by Proyecto Maya Colonial.

Intersite reference: One other sherd of this type has been described by Rice (1987a:131). She noted that it was an "unusual vessel" and classified it as a Sacá Polychrome: Sacá Variety type. The collared bowl has a combination of black, red, and black banding with decorative panels of plumes or curved lines.

Name: Macanché Red-on-paste: Macanché Variety

Frequency: Fourteen sherds from Zacpetén are included in this study. This represents eight percent of the Paxcamán ceramic group and 2.5% of the totals sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Rice (1987a:133-135) first defined Macanché Red-on-paste: Macanché Variety. Cowgill (1963:110) included this type in his Sacá Polychrome type description.

Types of analysis: "Low-tech" (14 sherds); petrographic (9 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (3 sherds).

Principal identifying modes: 1)Red decoration on a gray paste; 2) Red to red-orange slip; 3) Tripod plates and flanged tripod plates.

Paste and firing: Paste colors vary from brown (10YR 5/3) to light gray (7.5YR 5/1) to black (7.5YR 2.5/1). While most of the sherds are oxidized throughout, four have dark cores. Inclusions in the paste also vary: brown and light gray pastes tend to have more shell, quartz, and anhedral calcite, whereas the black pastes contain predominately euhedral calcite inclusions. Core hardness ranges from 2-3 (mostly 3) on the Mohs' hardness scale with an estimated firing temperature of 500-700° C. One sherd was fired to 400°C.

Surface treatment and decoration: Slip and decoration on Macanché Red-on-paste sherds is red (10R 4/6-7.5R 4/4) to purplish red (7.5R 3/3). However, it is not common for the slip and decorative color to be the same chroma of red. Slips and decorations lack any luster and have a Mohs' hardness of 2-3. Although most of the samples are fairly eroded, slips are not as thick (.375 mm) or prominent as those found on Ixpop Polychrome sherds. Some rims are darkened, but the darkening appears to be a result of fireclouding of the paste rather than darkening of a slipped rim.

Typically, tripod dishes are exteriorly slipped and decorated on the interior of the vessel. On three sherds, decorations appear to be painted on top of a lighter gray to whitish undercoat. Decoration on the exterior and interior surfaces occurs on some flanged tripod vessels. The red pigment used in the slip and decoration paintings is darker than most of the Paxcamán group ceramic slips. The darker (almost purplish red) paint is similar to Tachís pottery from Flores Island described by Cowgill (1963:110). One sherd from Structure 765 (raised shrine) has stucco applied to the exterior surface.

Decorated areas are delineated by two circumferential bands near the lip and one band at the base. In some cases, single line paneling is apparent on the interior decoration. Circles and hooks are the most prevalent interior decorations, while unpaneled curvilinear mat motifs occur on the exterior. One unique decoration from Zacpetén, on the base of a dish, is a distinctive bird that is negatively painted (the background is red). In addition to the decorative elements described above, a flanged tripod dish from Structure 605 (oratorio) has a banded decorative area with repeated *ilhuitl* images around the circumference of the dish.

Form and dimension: Tripod dishes (n=8) and flanged tripod dishes (n=4) are the only forms of Macanché Red-on-paste used in the study. Tripod dishes and flanged tripod dishes have trumpet and bulbous supports. Tripod dish rim diameters range from 20-24 cm ($\bar{x}$=21.43) with wall thicknesses of 5.11-9.58 mm ($\bar{x}$=7.1 mm). The direct rims have round, square, and interiorly beveled lip shapes. Flanged tripod dish rims vary from 20-24 cm ($\bar{x}$=21.5 cm) with wall thicknesses of 4.89-6.62 mm ($\bar{x}$=6.11 mm). The direct rims have rounded and interiorly beveled lip shapes. Flanged tripod dishes have a sagging base (vs. Ixpop Polychrome straight bottomed dishes) and the flanges have two left facing steps. However, one plate's flange steps face right. The first flange step height ranges from 3.3-4.69 mm and the second step height ranges from 5.29-9.81 mm. The vessel walls are taller than those of other decorated Paxcamán group ceramics.

Additional tripod supports not included in this study include effigy supports from Structure 603 (ceremonial sakbe). The effigy figures resemble effigy censer figures seen on Kulut Modeled censers.

Illustrations: Figure 15

Intrasite references: Zacpetén is the only site that has Macanché Red-on-paste:

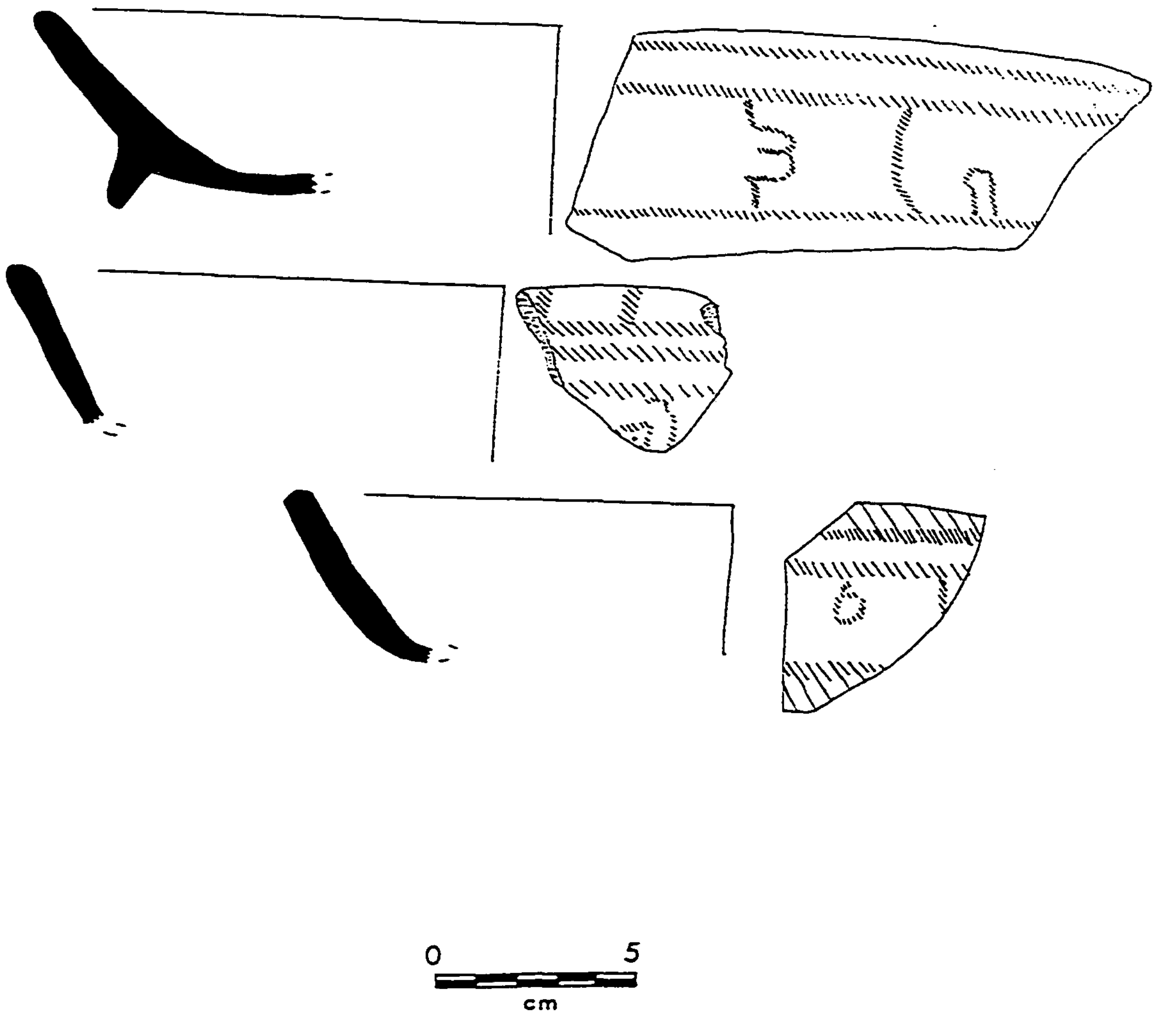


Figure 15: Macanché Red-on-paste: Macanché Variety Rim Profiles from Zacpetén.

Macanché Variety pottery. All of the flanged bowls were located in Structure 605 (oratorio) and Structure 719 (residence). Otherwise, all structures except 614 (oratorio) and 767 (open hall) contain Macanché Red-on-paste: Macanché Variety sherds. Structure 719 (residence) has the highest quantity of Macanché Red-on-paste: Macanché Variety sherds. All sherds come from the first three excavation levels.

Intersite references: Form and decoration technique of this type parallels that of Chompoxté Red-on-cream from Topoxté Island and Zacpetén. Macanché Red-on-paste: Macanché Variety also occurs at Tayasal, Macanché Island, and Canté Island.

My examination of the sherds from Tayasal shows that the sherds have a reddish brown or light brown gray paste. These pastes are different from those at other Late Postclassic sites in the Petén lakes region because Tayasal does not have the coarse paste with large quantities of euhedral calcite present at Zacpetén. Macanché Red-on-paste sherds from Tayasal also tend to have a pinkish exterior color that may suggest overfiring. The slip and decoration red pigments are not deep red or purple in color and have matte finish. Decorative elements consist of curvilinear lines and geometric decorations.

At Macanché Island, Rice (1987a:134) notes that Macanché Red-on-paste: Macanché Variety sherds appear in Protohistoric and Early Late Postclassic platform constructions. My observations of these pastes suggests a similarilty to those from Zacpetén–gray to reddish brown and snail inclusion with euhedral calcite. Exterior slips are red (10R 4/6), but one is more pink (7.5R 7/3). Decorative panels are marked by one or two red circumferential bands that are usually darker than the slip. Although most decorative elements are eroded, portions of curvilinear lines, hooks, and plumes are painted on a possible primary slip. Tripod dishes, collared bowls, jars, and flanged tripod dishes occur at Macanché Island. The flanged tripod dish has a single left facing step.

Rice (1979:68) provisionally defined a Red-on-paste type at Canté Island. The four sherds that represent tripod dishes and collared jars are eroded, but enough red painted decoration appears on a snail inclusion gray paste to define its presence at Canté Island.

Cowgill describes four Macanché Red-on-paste: Macanché Variety with his description of Sacá Polychrome sherds. He notes (Cowgill 1963:110) that one maroon-on-paste sherd takes a flanged dish shape and has a mat motif on the exterior surface.

Outside of the Petén lakes region, red-on-paste decoration occurs in northern Yucatán, Naco, Honduras, and the western Guatemalan highlands. The closest parallel to Macanché Red-on-paste: Macanché Variety decoration and form is from Chichen Itzá, Maní, and Mayapán. Tecoh Red-on-buff (San Joaquin Buff ware) occurs on tripod dishes and restricted orifice bowls in the Tases (A.D. 1300-1450) period (Smith 1971:29). Decorative elements include *ajaw* glyphs, circles, and mat motifs that are also common in the Petén lakes region (Smith 1971:231-232). Slatewares (Chumayel Red-on-slate and Canche Red-on-slate) also have red painted decoration on paste in northern Yucatán (Smith 1971:44-45). At Naco, Honduras, Nolasco Bichrome resembles Macanché Red-on-paste pottery (Wonderley 1981:172). Many red-on-white types with banded decoration areas and curvilinear lines also exist in the western Guatemalan highlands (Wauchope 1970).

Name: Macanché Red-on-paste: Tachís Variety

Frequency: One sherd from Zacpetén. This sherd comprises one percent of the Paxcamán ceramic group and .2 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal Identifying modes: 1) Angular red decoration on a gray paste; 2) Red slip; 3) Narrow neck jar.

Paste and firing: The pale brown (10YR 7/3) paste is oxidized throughout. It was fired to an estimated 600°C and has a Mohs' hardness of 3. Euhedral and subhedral calcite are the most prominent inclusions and the clay matrix also contains anhedral calcite, shell, quartz, and hematite.

Surface treatment and decoration: The slip and decoration have the same red (7.5R 5/8) color with a matte finish. The jar's neck exterior is slipped 42.27 mm from the rim and begins again below the decoration panel. Multiple "nested" chevrons appear in the unbanded, unpaneled decoration area. The interior of the neck is slipped from the rim to the neck/shoulder junction.

Form and dimension: This example is a narrow neck jar. The neck height is 9.5 cm and the rim diameter is 24 cm. The direct exteriorly thickened lip has a thickness of 9.66 mm and the neck wall thickness is 9.85 mm.

Illustration: Figure 16

Intrasite reference: This sherd was found at level 4 (below the last Postclassic f

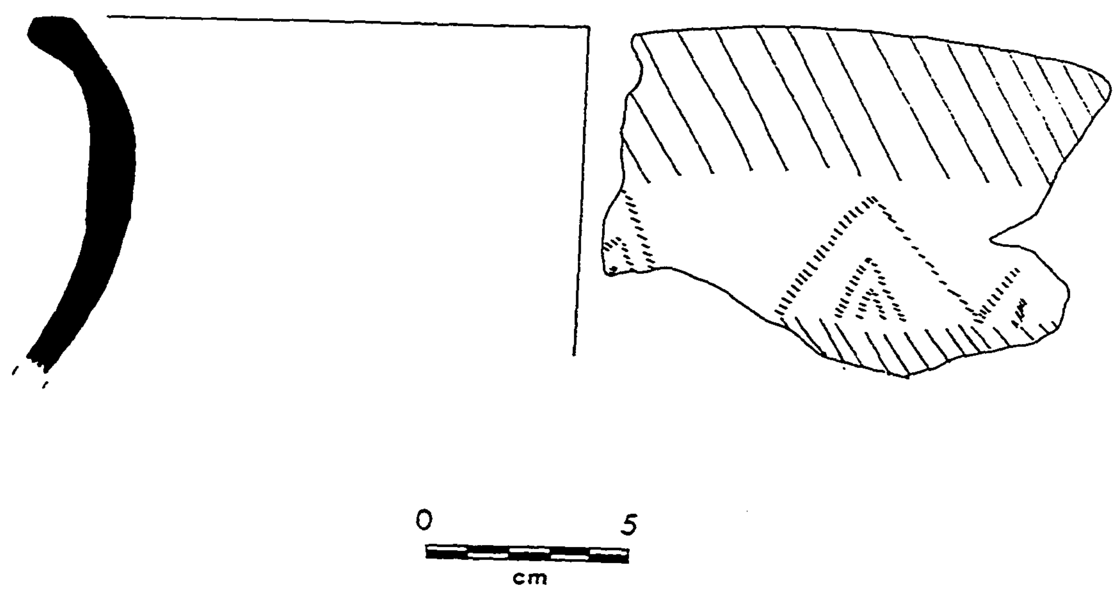


Figure 16: Macanché Red-on-paste: Tachís Variety Rim Profile from Zacpetén.

floor) in Structure 719 (residence) at Zacpetén.

Intersite references: Macanché Red-on-paste: Tachís Variety is analogous to Tachís pottery from Flores Island described by Cowgill (1963:112-115). The slip and decoration colors at Zacpetén are not a deep red to purple color as described by Cowgill. Red painted angled decorations on a paste background are also located at Tayasal and Macanché Island. I noted a series of nested squares on the flanged bowl sherd from Tayasal. The decoration color (10R 4/4) is darker than the exterior slip (10R 4/6), but not significantly darker. Decoration panels may exist and are marked by a solid block or red color.

Rice (1987a:133-134) includes this type in her description of Macanché Red-on-paste: Macanché Variety sherds. A narrow neck jar has a banded decoration area with embedded triangles.

Angular red-on-paste decoration (chevrons) also occurs in Tecoh Red-on-buff pottery from northern Yucatán in the Tases (A.D. 1300-1450) period (Smith 1971:29).

Name: Picú Incised: Picú Variety

Frequency: This description of Picú Incised: Picú Variety is based on 16 sherds: two from Zacpetén; six from Ixlú; one from Ch'ich'; and seven from Tipuj. This sample constitutes nine percent of the Paxcamán ceramic group and 2.9 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Cowgill (1963:96-109) first described Picú Incised: Picú Variety based on the ceramic collection from Lake Petén-Itzá.

Types of analysis: "Low-tech" (16 sherds); petrographic (8 sherds); x-ray diffraction (1 sherd); EDS and SEM and strong-acid extraction ICPS (4 sherds).

Principal identifying modes: 1) Post-slip, fine line incising; 2) Red slip; 3) Jar, collared jar, tripod plate, and restricted orifice jar forms.

Paste and firing: Picú Incised: Picú Variety has a reddish brown (5YR 5/4) to greenish gray (1 GLEY 5/1) paste color with five sherds exhibiting dark coring. The paste has a number of inclusions: euhedral and subhedral calcite; quartz; biotite; chert; and hematite. Nine sherds are fired to an estimated 550-700°C and seven are estimated to have been fired to 300°C. All cores have a Mohs' hardness of 3.

Surface treatment and decoration: Sherds are slipped various shades of red (10R 5-6- 2.5YR 5/8) with a majority of the sherds having a color value of 10R 4/6. Black fireclouds occur on sherds from Zacpetén and Ixlú while tan fireclouding occurs on sherds from Tipuj. Slip thickness is approximately .25 mm and slip hardness ranges from 2-3 on the Mohs' hardness scale.

Fine, post-fire incisions appear in decorative banded panels. Tripod plates and collared bowl decorations appear on the interior of the vessel (on the plate wall and neck wall, respectively) and jar and restricted orifice bowl decorations appear on the exterior of the vessel. Some decorations are done carefully while others are not, as indicated by poor line joins. Decorations are marked by one, two, or three circumferential bands. Jars typically have one at the top and bottom. Restricted orifice bowls, collared jars, one jar, and plates typically have two top and bottom bands. One collared jar has three top and bottom bands with a double middle band. The banded areas are normally broken by vertical double line paneling. Decorative elements include the *ilhuitl* glyph, nested chevrons, hooks, plumes, circular elements, mat motifs, birds, and possible split representations of the RE glyph (Rice 1987a:125). Although not included in this sample, an incised Lamat glyph appears on a collared jar from Ixlú. Decorations occur incised and excised.

Forms and dimensions: Tripod plates (n=2), collared jars (n=5), narrow neck jars (n=4), and restricted orifice bowls (n=2)have post-fire, fine line incising. Tripod plates have rim diameters that range from 24-28 cm ($\bar{x}$=6 cm) and wall thicknesses of 6.3-6.34 mm ($\bar{x}$=6.32 mm). The direct rims have square, round, and interiorly beveled lip shapes. Collared jar rim diameters vary from 22-32 cm ($\bar{x}$=28.4 cm) and wall thicknesses from 5.15-6.72 mm (6.22 mm). The direct rims have round or interiorly beveled lip shapes. Narrow neck jar rim diameters range from 14-28 cm ($\bar{x}$=20 cm) with wall thicknesses ranging from 4.7-9.82 mm ($\bar{x}$=6.17 mm). The direct rims have pointed, rounded, or exteriorly beveled lip shapes. Restricted orifice bowl rim diameters with rounded direct rims range from 10-18 cm ($\bar{x}$=14) with wall thicknesses of 4.82-4.89 mm ($\bar{x}$=4.86 mm).

Illustrations: Figure 17

Intrasite references: Picú Incised: Picú Variety sherds were located at Ch'ich', Ixlú, Zacpetén, and Tipuj. The sherds from Ch'ich' were located in level 2 (collapse) of Structure 188 (open hall). Ixlú sherds come from levels 1-4 of the following structures: 2015 (open hall), 2020 (oratory), 2021 (open hall), 2022 (open hall), 2023 (temple), 2034 (temple), and 2041 (residence).

Picú Incised: Picú Variety sherds from Zacpetén are found in all structures except 607 (statue shrine), 720 (statue shrine), and 758 (residence). All sherds come from the first four levels. Structure 767 (open hall) had the highest quantity of Picú Incised: Picú

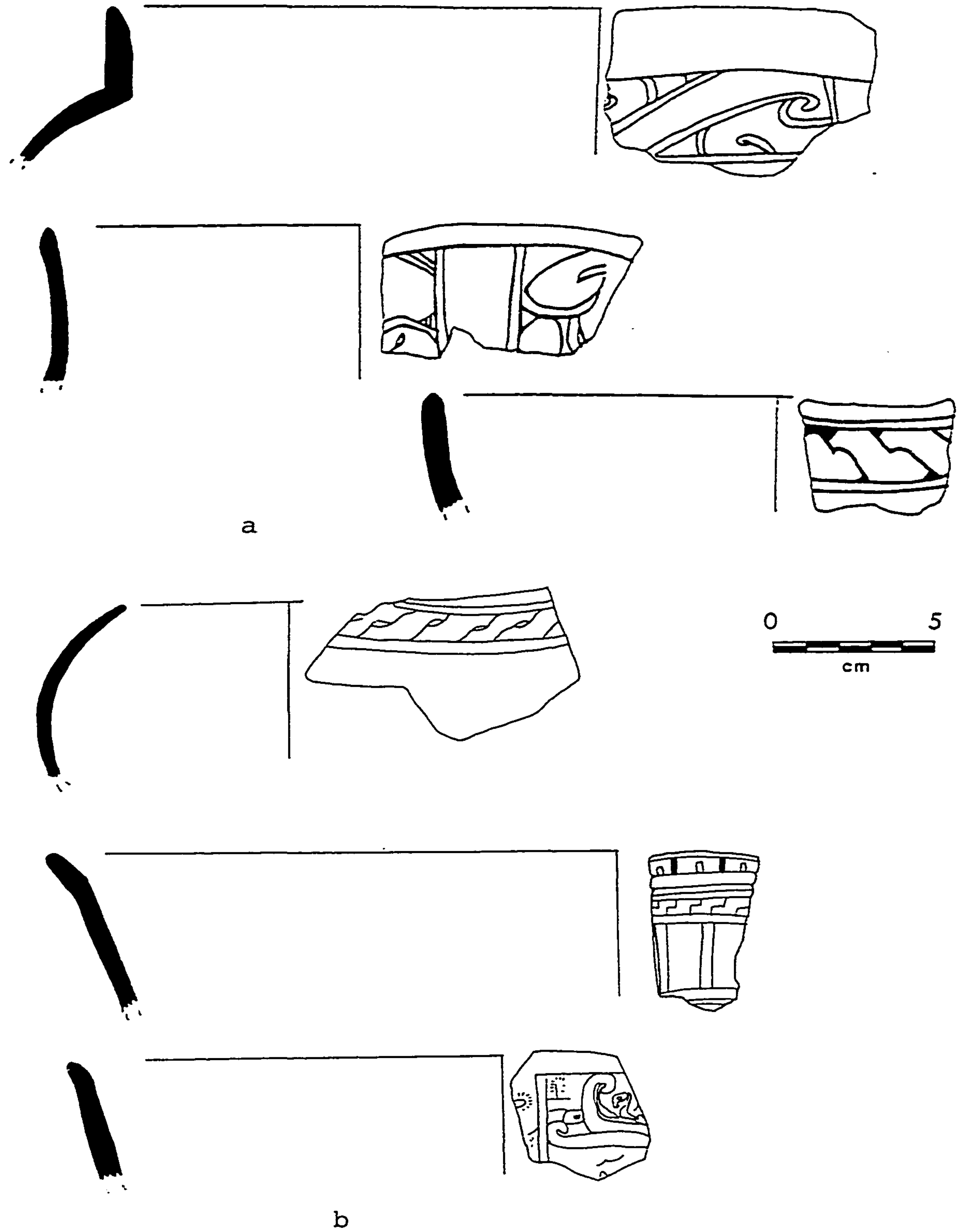


Figure 17: Picú Incised: Picú Variety Rim Profiles from Tipuj (a) and Ixlú (b).

Variety sherds. Tipuj structures 2 (temple), 3 (open hall) and 4 (open hall) contain Picú Incised sherds. All sherds come from the first four excavated levels. Structure 2 has the most elaborately incised vessels. The incised panels are combinations of birds and mat motifs. These sherds also are the most carefully made and best preserved.

Intersite references: Picú Incised: Picú Variety sherds were also located at Tayasal and Macanché Island. In general, the sherds the I examined from Tayasal exhibit exterior surface fine post-fire incising that resemble scratches. The other sherd represents a collared jar and is incised on the interior neck surface. The decoration is bounded by a single top and bottom circumferential band. The decoration appears to have been complex, but the only discernible decorative elements that remain are a series of curvilinear lines. Pastes are reddish brown and light gray with a red slip that is typical of other sites in the Petén lakes region.

I examined eight sherds from Macanché Island that had post-fire fine line incising. Cross-hatching and random scratches occur on the majority of the sherds of this type. One sherd, from Punta Nimá (Bullard's collection at the Florida Museum of Natural History), has a complex interior incised decoration. The top register of the decoration has a mat motif that is marked by three top and two bottom circumferential incised bands. The second register begins below the two bottom bands of the top register and consists of a probable reptilian motif (Rice 1987a:135). Some bowls are incised on the interior surfaces, but the decoration area is too eroded to determine decorative elements. Brown to light gray pastes with snail inclusions and red exterior slips at Macanché Island are within the range seen at other Postclassic Petén lakes sites.

The Picú Incised: Picú Variety collection from Flores Island exhibit complicated decorative motifs that are more similar to those at Tipuj than at other sites in the Petén lakes region (Cowgill 1963:Figure 4). All decoration areas are paneled and have alternating reptilian and mat motifs. Cowgill (1963:102) suggests a decorative motif affinity to Tulum in Quintana Roo.

Red-ware fine line incised pottery is common in northern Yucatán. Palmul Incised: Palmul Variety occurs at Tulum and Mayapán during the Tases period and Pustunich Incised Type: Pustunich Variety at Mayapán and Chich'en Itza (Smith 1971:30).

Name: Picú Incised: Thub Variety

Frequency: Eight sherds are the basis for the description of Picú Incised: Thub Variety: five from Ixlú, two from Ch'ich', and one from Tipuj. This type represents 4.3 percent of the sherds in the Paxcamán ceramic group and 1.4 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: A. Chase (1983:1220-1222) first described Picú Incised: Thub Variety from Tayasal ceramic collections.

Types of analysis: "Low-tech" (8 sherds); petrographic (4 sherds); x-ray diffraction (1 sherd); EDS and SEM and strong-acid extraction ICPS (4 sherds).

Principal identifying modes: 1) Pre-fire, deep incised lines; 2) Gray snail inclusion paste; 3) Red to red-orange slip; 4) Grater bowls and drums.

Paste and firing: Picú Incised: Thub Variety sherds have a gray (1GLEY 4/1) to brown (10YR 5/3) paste. Half of the sherds in the sample are incompletely oxidized and estimated firing temperatures range from 300-650°C with the majority of the sherds estimated to have been fired between 300-500°C. Core hardness is 3 on the Mohs' hardness scale. Euhedral, subhedral, and anhedral calcite and shell comprise most of the inclusions in the paste; however, biotite, chert, and ferruginous lumps (hematite) appear in small quantities.

Surface treatment and decoration: Grater bowls are slipped on the interior (to just below the top of the incised decoration) and exterior with a red (10R 4/6- 2.5YR 4/6) low luster slip and a Mohs' hardness of 2-3. Some of the low luster slips may be a result of double-slipping: a red base slip with a cream over-slip. Black and tannish-green fireclouds appear on the exterior surfaces of the grater bowls from Tipuj. The interior slip does not cover the incised portion of grater bowls. The drum sherd is slipped red (10R 4/6) below the vertical incisions.

Grater bowl pre-fire incisions encompass the bowls' sagging bottoms. The first line of incising occurs at the wall/base junction and encloses the incised pattern. A variety of patterns appear on interior surfaces of bowl bases with cross-hatched patterns most common. Curvilinear patterns are not uncommon. Not all of the vessels exhibit use wear.

The drum sherd has deep, vertical incisions that are approximately 24 mm in length. The incisions appear directly below an externally thickened rim. The matte slip begins 10 mm from the base of the incisions and covers the remaining sherd.

Form and dimensions: The type is comprises grater bowls (n=7) and drums (n=1). Grater bowl rim diameters vary from 22-28 cm ($\bar{x}$=24.57) with wall thicknesses of 6.66-8.86 mm ($\bar{x}$=7.62 mm). Direct rims are rounded or interiorly beveled. Grater bowls have sagging bottoms with scroll supports.

The drum sherd has a diameter of 16 cm and a wall thickness of 8.92 mm. As stated previously, the direct rim is exteriorly thickened. The drum neck resembles those of narrow neck jars.

Illustrations: Figure 18

Intrasite references: Grater bowls from Ixlú come from level three (floor) of Structure 2023 (a temple), the grater bowls from Ch'ich' are level 2 (collapse) of Structure 188 (a colonnaded hall), and the grater bowl from Tipuj is from level 2 (collapse) of the Postclassic Plaza. The drum sherd from Ixlú comes from level 2 (collapse) of Structure 2034 (a large range structure).

In addition to the sherds used in this study, Picú Incised: Thub variety sherds also occur at Zacpetén in the form of grater bowls and drums. Grater bowls from Zacpetén occur in the following structures: 606 (open hall), 614 (oratorio), 615 (open hall), 664 (residence), 719 (residence), 721 (temple), 732 (residence), 747 (residence), 748 (residence), 758 (residence), 764 (temple), 765 (raised shrine), 766 (statue shrine), 767 (open hall), and 1001 (plaza fill). Drum sherds occur in the following structures at Zacpetén: 603 (ceremonial sakbe), 719 (residence), 748 (residence), 764 (temple), 765 (raised shrine), and 767 (open hall). Drum incisions occur in groups of two or three. Tipuj grater bowls come from Structures 2 (temple) and 3 (open hall). A grater bowl from Structure 2 was burned.

Grater bowls from Zacpetén tend to have darker red to purple slips with occasional black fireclouds. The slips are relatively thick and well preserved. Grater bowls that were not used may have been ceremonial, thus possibly explaining their

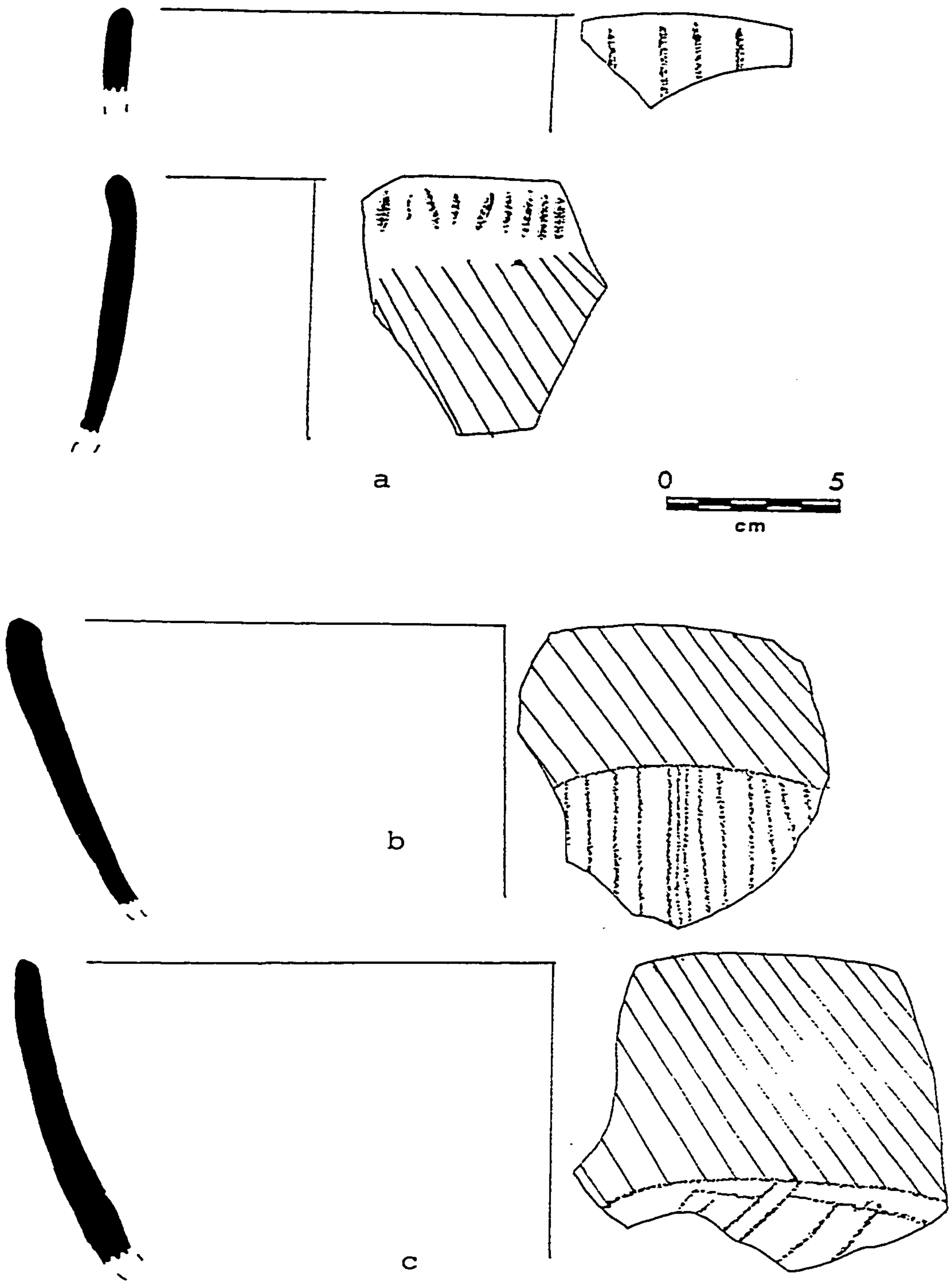


Figure 18: Picú Incised: Thub Variety Rim Profiles from Tipuj (a), Ixlú (b), and Ch'ich' (c).

appearance in the ceremonial structures from Ch'ich', Ixlú, and Zacpetén.

Intersite references: Grater bowls and drums exist in all Postclassic slipped pottery types: Hobonmo Incised: Hobonmo Variety, Xuluc Incised: Tzalam Variety, Dulces Incised: Bebeto Variety, and Mengano Incised: Bobo Variety. Deep line pre-fire incising occurs on grater bowls and drums from Tayasal and Macanché Island. My observation of grater bowls from Tayasal indicate the presence of two different decorative patterns characterized by a single incised circumferential band. The first pattern consists of a series of diagonal lines and in between the lines is a series of rounded punctations. The entire vessel including the incised area is slipped. The second pattern is a series of "v"s. Slip does not occur in the incised area. Drum forms at Tayasal have a series of vertical incision below the rim and the slip begins below the incisions. Reddish brown to light gray paste colors occur in both pottery forms at Tayasal. The clay matrix is coarser than those at other Petén lake sites.

My examination of the grater bowls from Macanché Island shows that incisions are divided into four sections and each section is cross-hatched. The incised area is enclosed by a circumferential incised band. The interior surface is slipped the same color as the exterior and the slip does not appear in the incised area. Slip colors are typical Paxcamán Red slips with matte and low luster finishes. Black fireclouding is rare. All grater bowl sherds have evidence of use wear. Paste color and textures vary from tan to brown to gray with ashy to coarse textures.

Drums from Macanché Island have vertical incisions beginning at the lip and terminating at the shoulder. The vertical incisions are approximately 2.5-3.2 cm long and is slipped red below the incised area. Although the sherds are fragmentary, the incisions do not appear to be in groups of two or three as described above. Pastes are gray with an orange oxidized layer underneath the slip.

Grater bowls and drums exist in northern Yucatán. Xuku Incised (Chichen Red Ware), Pencuyut Incised: Pencuyut Variety (San Joaquin Buff ware), Xcanchakan Black-on-cream (Peto Cream ware), and Chichen Slate ware have grater bowl forms that resemble those found in the southern lowlands (Smith 1971: 16,17, 27, 45). Postclassic drum forms occur in Mama Red (Mayapán Red Ware) and Tekit Incised (Puuc Slate) types (Smith 1971:22, 27).

Grater bowls occur in unslipped types and occur in Late Classic and Terminal Classic deposits at Uaxactún (Smith 1955), Zacpetén, and Ixlú (personal observation). Drums may also have begun in the Classic era. Individuals are seen on Late Classic polychrome vessels carrying and/or playing "drums." Therefore, as noted with respect to the above description of Postclassic grater bowls and drums, the grater bowl and the drum are not Postclassic creations, but have their antecedents in the Late Classic period.

Name: Picú Incised: Cafetoso Variety

Frequency: One sherd from Zacpetén defines this type. Picú Incised: Cafetoso Variety comprises one percent of the sherds of the Paxcamán ceramic group and .2 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal identifying modes: 1) Pre-fire, thin incisions on a tan to brown slip; 2)

Red slip; 3) Snail inclusion paste; 4) Tripod dish.

Paste and firing: The pale brown (10YR 6/3) paste has a dark core (2.5Y 6/1). It was estimated to have been fired to 650°C and has core Mohs' hardness of 3. Anhedral calcite dominates the clay matrix, but quartz, shell, euhedral and subhedral calcite, ferruginous lumps (hematite), and possibly biotite appear as other inclusions.

Surface treatment and decoration: The exterior of the sherd has a well preserved red (2.5YR 5/8) low luster slip with a Mohs' hardness of 3. The interior surface is slipped brown (10YR 5/4), but the brown color is mottled. The brown slip also has a low luster and a Mohs' hardness of 3. Red slip from the exterior surface and rim bleeds into the brown slip.

Fine line, post-fire incising appears in the brown slipped area of the interior surface. The decoration is marked by an upper double band. Plumes and curved lines with a two "eyes" or a possible stylized RE glyph occur within the defined decoration area.

Form and dimensions: This sherd appears to be from a tripod dish (but could also be part of a small collared bowl) with a rim diameter of 18 cm and a wall thickness of 5.3 mm. The direct rim has a square lip.

Illustration: Figure 19

Intrasite reference: The sherd described here was found at Structure 764 (temple) in a collapse level (level 2). Picú Incised: Cafetoso sherds not included in this study were also located in Structure 719 (residence).

Intersite references: No parallels exist in the Petén lakes region or in other Maya lowland areas.

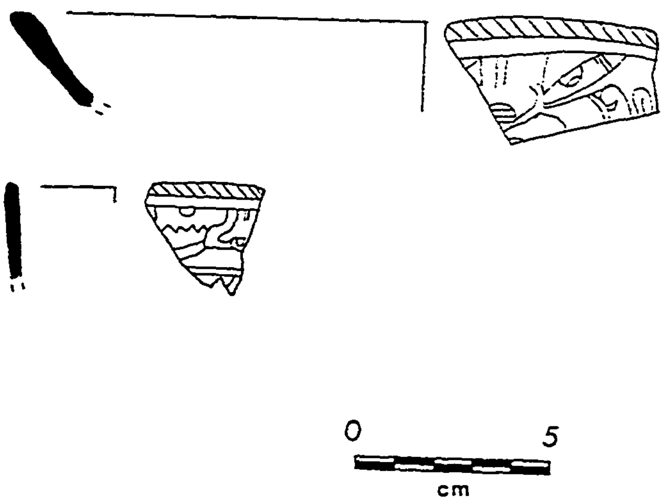


Figure 19: Picú Incised: Cafetoso Variety Rim Profiles from Zacpetén.

Fulano Ceramic Group

The Fulano ceramic group is a new designation based on Postclassic pottery collections excavated from Zacpetén, Ixlú, and Tipuj. Fulano ceramics were found at Zacpetén, Ixlú, Ch'ich', and Tipuj. They differ from those of the Paxcamán ceramic group on the basis of paste and slip characteristics, being gray with darker gray cores. Unlike the Paxcamán ceramic group pastes, those of the Fulano ceramic group do not demonstrate the wide color and texture variability. Fulano pastes include euhedral and subhedral calcite, shell, ferruginous lumps (hematite), quartz, biotite and small, rounded fossils. Cryptocrystalline calcite is also abundant, but may be a natural mineral in the clay matrix.

Fulano slips are black (7.5YR 3/1 to 2.5Y 2.5/1) and can have a low luster. Occasionally, the black slip is interspersed with red mottling which may suggest that the slip coloring resulted from firing in a reducing atmosphere. Experimental refiring of sherds to 800°C in an oxidizing kiln resulted in half of the slips changing to red (10R 4/2 to 2.5YR 5/8) while half remained black (7.5YR 3/1). The majority of the sherds whose slips changed to red are monochrome types (Fulano Black: Fulano Variety), while the majority of the sherds whose slips remained black are decorated (Sotano Red-on-paste: Sotano Variety and Mengano Incised: Mengano Variety). The differences in firing time, temperature, and atmosphere of the Fulano ceramic group may mirror that of the Trapeche ceramic group. Refired paste color variability resembles that of the Paxcamán ceramic group discussed above.

Therefore, the principal identifying modes of the Fulano ceramic group are as follows: 1) Gray snail inclusion paste and 2) Black, low luster slip.

Name: Fulano Black: Fulano Variety

Frequency: Nine sherds define this type: four from Ixlú, one from Ch'ich', and four from Tipuj. Fulano Black: Fulano Variety comprises 64 percent of the Fulano ceramic group and two percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Ch'ich', Ixlú, and Zacpetén.

Types of analysis: "Low-tech" (9 sherds); petrographic (3 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (2 sherds).

Principal identifying modes: 1) Black slip; 2) Gray, snail inclusion paste, 3) Tripod dishes, narrow neck jars, and collared bowls.

Paste and firing: Paste color varies from grayish brown (10YR 5/2) to gray (5YR 6/1) to dark grayish brown (2.5Y 3/2). Dark gray cores commonly occur. Estimated firing temperatures range from 300-600°C (darker cores indicating firing at lower temperatures) with a core Mohs' hardness of 3. Cryptocrystalline calcite predominates the clay matrix and may be naturally occurring; however, the clay matrix also includes euhedral and subhedral calcite, quartz, shell, hematite, biotite, and small rounded fossils.

Surface treatment and decoration: Slips have a matte or low luster finish and a Mohs' hardness of 3. Thicknesses range from .375 to .25 mm. The matte finish may be a result of erosion because all of these sherds were located in the humus level (level 1) of excavation. Some areas of the black slip have red spots that may indicate that the black slip is a firing variant of a red slip. This is further supported by refiring tests in which most of the Fulano Black: Fulano Variety black slips did turn red at 800°C. Interior and exterior surfaces are slipped.

Forms and dimensions: Tripod plates (n=2), narrow neck jars (n=5), and collared jars (n=2) appear in this type. Tripod plate rim diameters range from 16-30 cm ($\bar{x}$=23) with wall thickness of 5.19-6.22 mm ($\bar{x}$=5.71 mm). The direct rims have a round or interiorly beveled lip shape. Narrow neck jar rim diameters range from 14-26 cm ($\bar{x}$=18) with wall thicknesses of 5.11-8.95 mm ($\bar{x}$=6.93). The direct rims have a rounded lip shape. Collared jar rims diameters range from 32-38 cm ($\bar{x}$=35) and wall thicknesses of 6.56-8.93 mm (mean=7.75 mm). The direct rims have a rounded lip shape.

While not part of the sample for this study, scroll supports and restricted orifice bowls occur with black slips.

Illustrations: Figure 20

Intrasite references: Fulano Black: Fulano Variety sherds that are used in this study were found in the first two levels (humus and collapse) in the following structures at the following sites: Ch'ich' Structure 188 (open hall) ; Ixlú Structure 2017 (open hall), Structure 2022 (open hall), and Structure 2021 (open hall); Tipuj Structure 1 (an oratory) and Structure 2 (temple).

In addition to the above locations, Fulano Black: Fulano Variety was also noted in the following structures from Zacpetén: 601 (raised shrine), 605 (oratorio), 606 (open hall), 614 (oratorio), 664 (residence), 719 (residence), 721 (temple), and 747 (residence). Structures 719 and 764 have the highest frequency of Fulano Black sherds.

At Ixlú, Structure 2021 has the highest frequency of Fulano Black sherds. Fulano Black sherds were also located in the following Ixlú structures: 2003 (residence), 2005 (building in the twin-pyramid complex), 2023 (temple), 2034 (temple), and 2041 (residence).

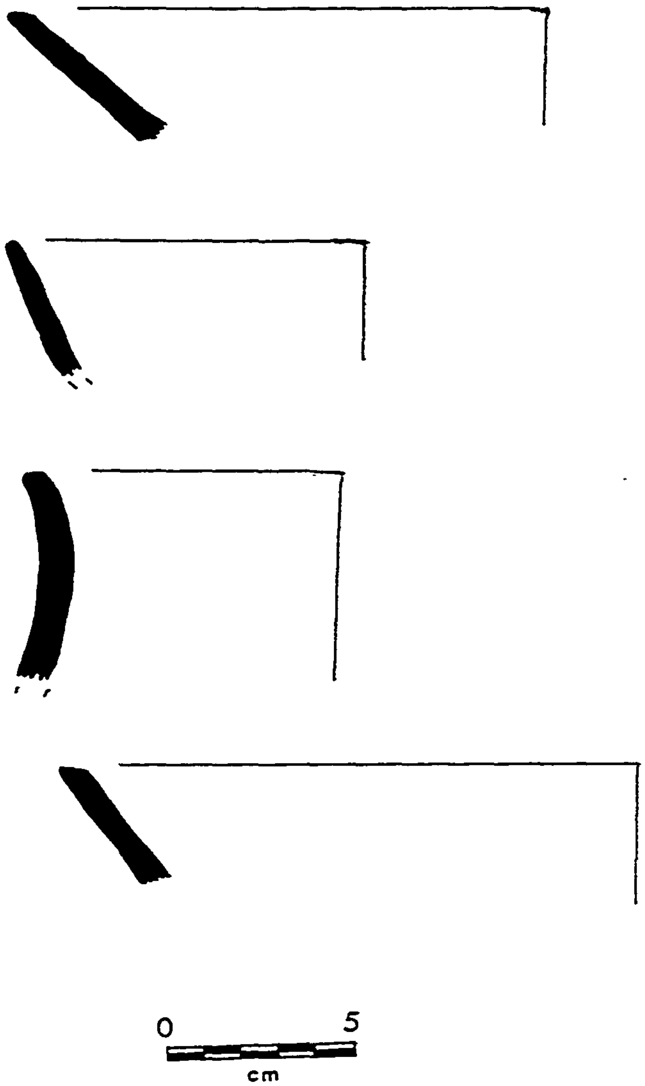


Figure 20: Fulano Black Rim Profiles from Ixlú.

Intersite references: Fulano Black: Fulano Variety has no equivalents in the Postclassic period in the Petén lakes region. However, the Terminal Classic and Late Classic periods do have black-slipped pottery. Some black slips of the Late and Terminal Classic periods, such as Achote Black, Infierno Black, and Mt. Maloney Black, resemble those of the Fulano Black slips. These black slip may be a result of a reduced Paxcamán Red slip as described above.

My examination of sherd from Tayasal and Macanché Island yielded some Fulano Black sherds. Tayasal Fulano Black sherds have a dark gray paste with a black slip. The black matte slip has spots of red and tan colors. Tripod dishes and jars are represented in the collection.

Rice (1987a:155-157) describes a gray slipped pottery type at Macanché Island that upon my reexamination should be categorized as Fulano Black. All sherds have a dark gray paste that is typical of the Fulano Black pastes at other sites. Most of the slips have a matte finish and an oxidized layer exists beneath exterior slips. Low luster slips, while rare, do occur and resemble the slips of Zacpetén sherds.

Outside of the Petén lakes region, black slipping occurs in northern Yucatan. Types, such as Mayapán Black, have slips that appear to be analogous to the Fulano Black slips (Smith 1971:17-20). These types are widely distributed in the entire Postclassic period and are more common than those in the Petén area.

Name: Sotano Red-on-paste: Sotano Variety

Frequency: Four sherds (two from Zacpetén and 2 from Ixlú) from the present study define this type. Sotano Red-on-paste: Sotano Variety comprises 29 percent of the

Fulano ceramic group and one percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Ixlú and Zacpetén.

Types of analysis: "Low-tech" (4 sherds); petrographic (3 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal Identifying modes: 1) Red decoration elements on a gray paste background; 2) Gray snail inclusion paste; 3) Tripod dishes.

Paste and firing: Pastes are incompletely oxidized and colors range from light gray (5Y 7/1) to dark gray (10YR 3/1). The sherds were estimated to have been fired between 400-600˚C with a core Mohs' hardness of 3. Some of the lighter gray sherds have a darker gray core. Inclusions are similar to those described for Fulano Black: Fulano Variety.

Surface treatment and decoration: Exterior surfaces are slipped black with a low luster finish; however, one sherd has a matte finish. The sherd with a matte finish also shows spots of red in the black paint. When the sherd with the matte finish was refired to 800˚C, the exterior surface changes to a weak red (10R 4/2) while the low luster black exterior surfaces remain dark brown (7.5YR 5/6) to black (2.5YR 2.5/1). Slips are approximately .25 mm thick.

Interior surfaces are decorated with a dark red (10R 4/2) paint. The interior surfaces, where preserved, have a very pale brown (10YR 8/3) undercoat on which the decoration is painted. Similar to Macanché Red-on-paste: Macanché Variety decorations, the decoration area is banded. Single or double circumferential bands appear near the rim and the wall/base junction has a single circumferential band. Painting seems to be done in a three step process: 1) decoration is painted first; 2) bands are painted; and 3) the exterior and rim are slipped. Decorative elements, two of which remain, appear to be curvilinear and a possible glyph representation. The curvilinear decoration is a negative decoration (the background is painted red rather than a line drawing). The other two decoration areas are eroded. Hardness measurements of the interior decoration and undercoat range from 2 to 3.

Forms and dimensions: The four sherds discussed here are from tripod dishes. The tripod dish diameters vary from 16-24 cm ($\bar{x}$=20.67) with wall thickness of 4.77-8.16 mm ($\bar{x}$=7.03). The direct rims have interiorly beveled or round lip shapes.

Illustrations: Figure 21

Intrasite references: The two sherds from Zacpetén are from Structure 719 (residence): one is from a level 1 (humus) and one is from level 8 (a level in a Postclassic deposit). The two sherds from Ixlú are from Structure 2021 (open hall): one is from level 2 (collapse) and one is from level 4 (below the first occupation floor). Other Sotano Red-on-paste sherds have been found at Structures 732 (residence) and 764 (temple) at Zacpetén.

Interregional references: Sotano Red-on-paste resembles Macanché Red-on-paste: Macanché Variety and Chompoxté Red-on-paste: Akalché Variety. The decoration area is delineated by red circumferential bands and the decorations are painted red. Sotano Red-on-paste red decorations tend to have a brown tint instead of being dark red to almost purple red.

Macanché Island is the only other site in the Petén lakes region that has Sotano Red-on-paste pottery. Again, these sherds were classified by Rice (1987a:155-157) as an

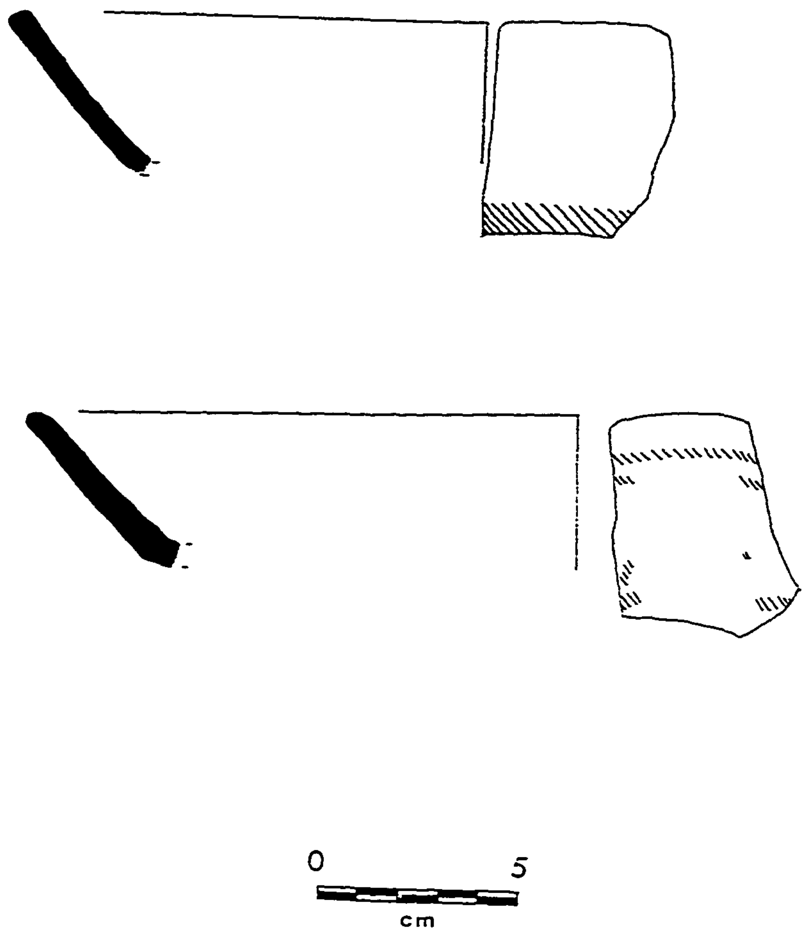


Figure 21: Sotano Red-on-paste: Sotano Variety Rim Profiles from Zacpetén.

unnamed gray ware with eroded band decoration. Upon my further examination of the Macanché Island collection at the Florida Museum of Natural History, jars, restricted orifice bowls, and tripod dishes have red bands with black slip. The decorations and bands are fairly eroded, but enough remains to refine the classification of this pottery.

Similarities to this type do not exist outside of the Petén lakes region.

Name: Mengano Incised: Mengano Variety

Frequency: One sherd from Zacpetén. Mengano Incised: Mengano Variety comprises seven percent of the Fulano ceramic group and .2 percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal Identification modes: 1) Post-fire, fine line incising and excising; 2) Black slip; 3) Gray snail inclusion paste; 4) Collared jar.

Paste and firing: The gray (2.5Y 6/1) paste is similar to that described for Fulano Black: Fulano Variety. Core Mohs' hardness is 3 with an estimated firing temperature of 400°C. Euhedral and subhedral calcite, quartz, hematite, and shell appear in the clay matrix with cryptocrystalline calcite occurring most commonly.

Surface treatment and decoration: The exterior surface is slipped black (2.5Y 2.5/1) and has been burnished so that it is glossy in places. Thickness range from .625-.25 mm and have a surface Mohs' hardness of 3. When refired to 800°C, the slip color does not change.

The interior neck of the collared bowl is incised. The neck is also slipped black (2.5Y 2.5/1), but when refired to 800°C, light red (2.5YR 6/6) spots appear in the black slip. The interior slip also has a hardness of 3. Decorations are excised so that the background color is the paste color and the decorative element is black. The decoration area is double banded on the top and single banded on the bottom with a bird motif appearing between the bands.

Forms and dimensions: The collared bowl has a wall thickness of 6.7mm. The rim diameter cannot be measured because of the smallness of the sherd, but the direct rim has a rounded lip shape.

Illustration: Figure 22

Intrasite reference: This sherd was located in level 2 (collapse) of Structure 719 (residence) at Zacpetén. In addition to Structure 719, Mengano Incised sherds were located in Structure 732 (residence) at Zacpetén and Structure 1 (oratorio) at Tipuj.

Intersite references: Mengano Incised: Mengano Variety resembles Picú Incised: Picú Variety, Hobonmo Incised: Ramsey Variety, and Dulces Incised: Dulces Variety. The post-fire fine line incising is similar in the negative decoration technique, circumferential banding, and motifs to other sherds in the Petén lakes region. However, negative decorations are far more rare than positive decorations. In addition to Postclassic types, the black slip incising is similar that of Cubeta Incised and Carmelita Incised types in the Late and Terminal Classic periods in the Maya lowlands.

Macanché Island is the only other site in the Petén lakes region to have Mengano Incised: Mengano Variety sherds. Rice (1987a:155) describes incised vessels with

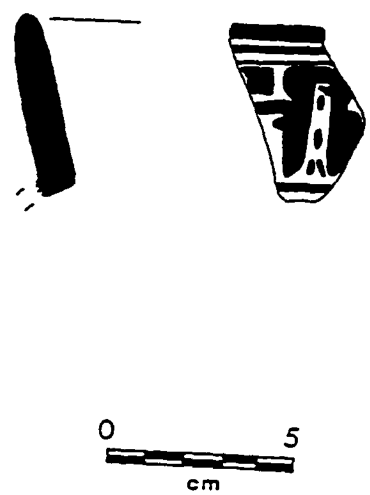


Figure 22: Mengano Incised: Mengano Variety Rim Profile from Zacpetén.

"indeterminate incised motifs" as an Unnamed Gray Slipped type. Upon my further examination of the Macanché Island collection at the Florida Museum of Natural History, Rice's Unnamed Gray Slipped type with incisions is Mengano Incised: Mengano Variety. Vessel forms include bowls, jars, and collared rims. However, unlike the examples from Zacpetén and Tipuj, the incising is not of high quality.

Fine line incising on black slipped Postclassic pottery occurs in northern Yucatán. Pacha Incised: Pacha Variety of the Mayapán Black ware occurs in the Hocaba and Tases periods at Mayapán (Smith 1971:22).

Trapeche Ceramic Group

Name: Trapeche Pink: Tramite Variety

Frequency: Sixty-three sherds are the basis for this description of Trapeche Pink: Tramite Variety: 41 from Zacpetén; 20 from Ixlú; and two from Ch'ich'. This constitutes 86 percent of the sherds in the Trapeche ceramic group and 11.5 percent of the sherds in the present study.

Ware: Volador Dull-Slipped ware.

Established: Rice (1987a:139-145) defined this variety based on Bullard's Macanché Island pottery collection. A general designation of Trapeche Pink pottery was first described by Chase (1979:104-109).

Types of analysis: "Low-tech" (63 sherds); petrographic (37 sherds); x-ray diffraction (4 sherds); EDS and SEM and strong-acid extraction ICPS (15 sherds).

Principal identifying modes: 1) Cream to "pink" to orangish-red slip; 2) Gray snail inclusion paste; 3) Tripod dishes, collared jars, bowls, and narrow neck jars.

Paste and firing: Trapeche Pink: Tramite Variety pastes are very similar to those of Paxcamán Red and Fulano Black types. The pastes are dark gray (2.5Y 4/1, GLEY1 4/N) to gray (10YR 6/1). Approximately one-half of the sherds have darker gray cores indicating that they were incompletely oxidized. Estimated firing temperatures range from 300-600°C. Core hardness is 3 on the Mohs' hardness scale.

The clay matrix is composed of gray colored clay, cryptocrystalline calcite, shell, quartz, and hematite inclusions. Twenty-five percent of the clay matrices also include euhedral and subhedral calcite, biotite, and/or chert.

Surface treatment and decoration: The exterior and interior (when slipped) slip colors range from red (2.5YR 5/6) to yellowish red (5YR 5/6) to light brown (7.5YR 6.4) to light brownish gray (10YR 6/2). The majority of the sherds are double slipped: the primary slip near the sherd surface is red, dark brown, or greenish brown, and it is covered by a thin, translucent tan to a creamy white secondary slip with a "waxy" feel. In some areas, the double slipping is obvious while in other areas the double slipping is difficult to distinquish. Double slipped surfaces also have a low luster. In thin section, the slip (.125-.1 mm) is over an oxidized layer (.225-.1 mm). The overslip appears to be thinner (.05 mm) than the primary slip. The slips are generally well preserved with a Mohs' hardness of 2-3. Black fireclouding appears infrequently.

Forms and dimensions: Tripod dishes (n=14), flanged tripod dishes (n=1), collared jars (n=5), restricted orifice bowls (n=2), and narrow neck jars (n=8) are represented in the Tramite variety sample. Of the 63 sherds that are used to describe this type, only 30 are distinguishable as to form. Tripod dishes have a flat base with slighly outflaring walls. Tripod dish rim diameters range from 20-28 cm ($\bar{x}$=25.43 cm) with wall thickness of 5.12-8.12 mm ($\bar{x}$=6.22 mm). The direct rims have rounded or interiorly beveled lip shapes. Tripod scroll supports occur in this collection of pottery.

Collared jar rims are outflaring. The rim diameters vary from 26-34 cm ($\bar{x}$=30.33) with wall thicknesses of 5.12-8.85 mm ($\bar{x}$=7.36). The direct rims have rounded or interiorly beveled lip shapes.

Restricted orifice bowl mouth diameters range from 10-14 cm ($\bar{x}$=12) with wall thicknesses of 5.96-6.45 mm ($\bar{x}$=6.21 mm). One direct rim has a pointed lip shape and the other has an interiorly thickened lip shape.

The narrow neck jar rim diameters range from 12-32 cm ($\bar{x}$=16.62 cm) with wall thicknesses of 6.49-10.09 mm ($\bar{x}$=8.69 mm). The direct rims have exteriorly thickened lip shapes.

The flanged plate is represented by a body sherd with a two-stepped flange that faces left. The flanges are 6.73 mm in height.

Illustrations: Figures 23, 24

Intrasite references: The sherds in this study were excavated at Ch'ich', Ixlú, and Zacpetén. Trapeche Pink sherds in Structure 188 at Ch'ich' were excavated in the first and second levels (humus and collapse). Ixlú Trapeche sherds also appear in the first two levels of excavation in the following structures: 2003 (residence), 2017 (open hall), 2021 (open hall), 2022 (open hall), 2023 (temple), 2034 (temple), and 2041 (residence). Trapeche Pink sherds from Zacpetén were found in levels one through four in Structures 601 (raised shrine), 603 (sakbe), 605 (oratorio), 664 (residence, 720 (statue shrine), 721 (temple), 732 (residence), 747 (residence), 748 (unknown), 758 (residence), 764 (temple),

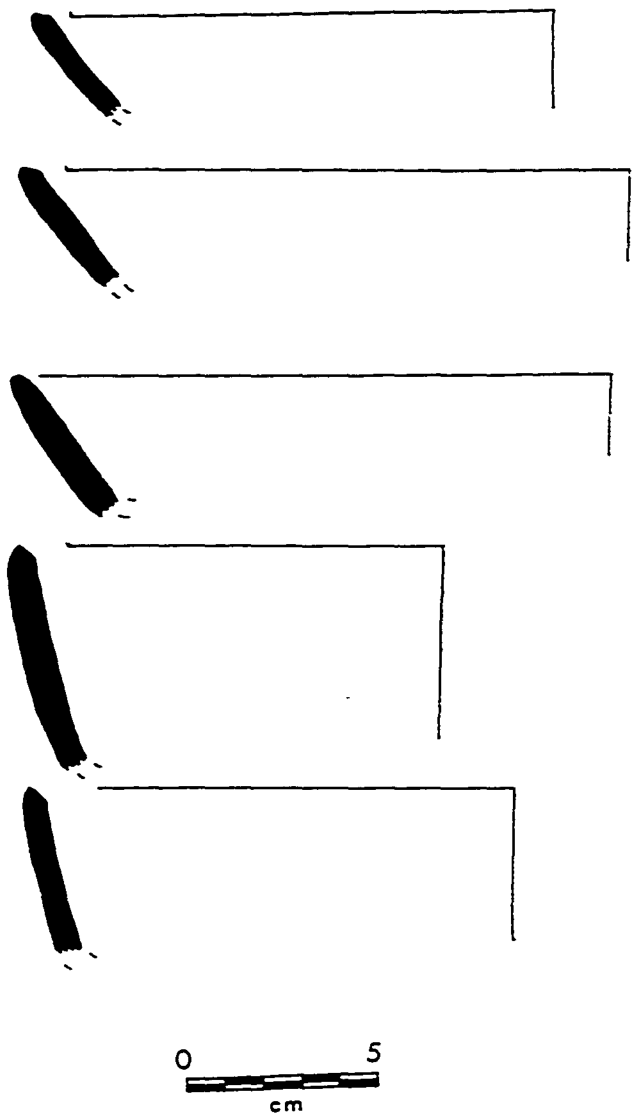


Figure 23: Trapeche Pink Tripod Plate Rim Profiles from Zacpetén.

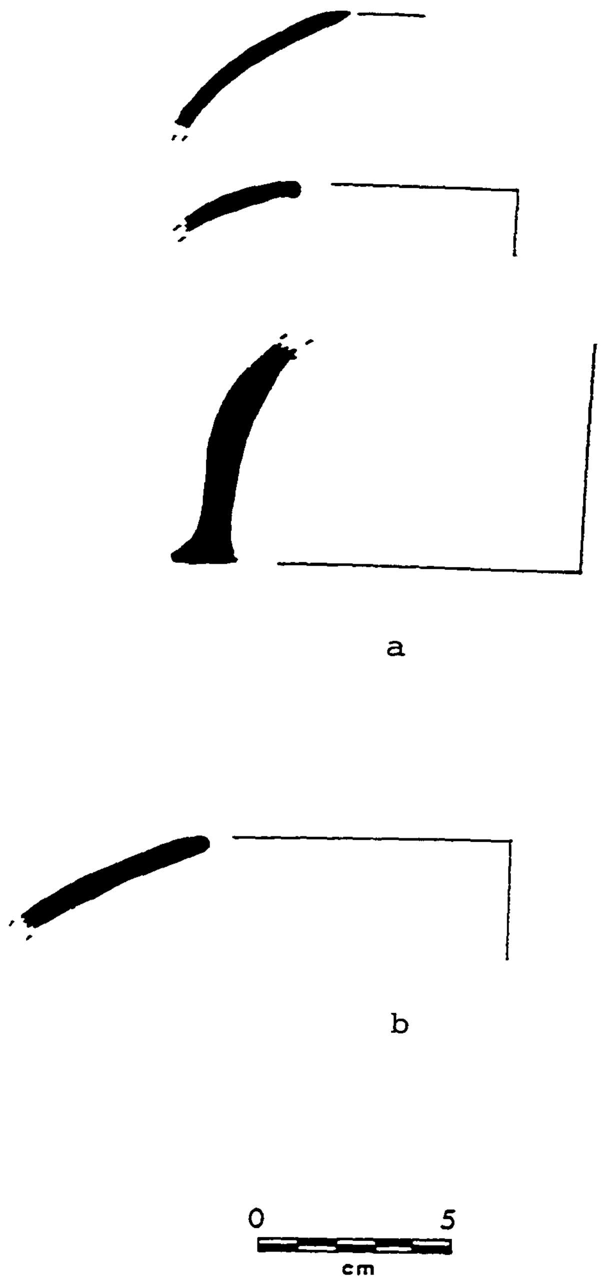


Figure 24: Trapeche Pink Miscellaneous Rim Profiles from Zacpetén (a) and Ixlú (b).

767 (open hall), and in levels one through four and eight of Structure 719 (residence). The majority of Trapeche Pink sherds come from Structure 721 (temple).

In addition to the above locations, other Trapeche Pink sherds were found at Ixlú in Structure 2005. Zacpetén Trapeche Pink sherds also occur in the following structures in levels one and two: 606 (open hall) and 615 (open hall).

Intersite references: Some Trapeche Pink slips tend to be more red than pink or have areas where a red primary slip is seen below a creamy secondary slip. The redness of the primary slip is very similar to Paxcamán Red slips (Rice 1987a:112-113). In addition to the similarities between Trapeche Pink and Paxcamán Red slips, Trapeche Pink outer or secondary slips also resemble Harina Cream slips of the Terminal Classic period.

Trapeche Pink sherds were also excavated at Tayasal and Macanché Island. I noted from my examination of the Trapeche Pink sherds from Tayasal a wide variety of paste colors that range from reddish brown to light gray. Unlike the sherds from Zacpetén, Tayasal sherds do not have dark gray pastes. The sherds from Tayasal demonstrate the distinct Trapeche Pink double slip that is a result of a double slip: red and cream. These Tayasal slips are also thicker and more "waxy" which may be the result of preservation. While the double slipping is prominent, some sherds have a single tan or creamy (7.5YR 6/6) slip. These slips usually have a matte finish. Forms and dimensions are within the range described above.

I also examined a large collection (n=1162) of Trapeche Pink: Tramite Variety sherds from Macanché Island. The sherds also have either a "waxy" double slip of red and cream or a single thick cream slip. Black fireclouding is prevalent. Typically, a thin bright orange oxidized paste layer occurs beneath the black fireclouds and the rest of the paste is dark gray. Unlike, Tayasal, most Macanché Island Trapeche sherds have very dark gray pastes (1GLEY 4/1), but some paste appear to be volcanic ash tempered resulting in a tan (10YR 6/3) paste color. Sherds with the tan paste also have a tan slip with red mottling. Thirty-five percent of these sherds have black fireclouds.

Tan or cream slips that resemble those of Trapeche Pink: Tramite Variety sherds occur in northern Yucatán. Some slatewares such as Thin Slate and Puuc Slate (A.D. 800-1000) have a tan to gray waxy slip (Smith 1971:164-165). In addition to slatewares, Peto Cream, Kukula Cream, and San Joaquin Buff wares (A.D. 1200-1450) have creamy to tan slips that range to pink or pinkish cinnamon (Smith 1971:27, 29, 45, 231). Vessel forms resemble those of Trapeche Pink: tripod dishes, jars, and restricted orifice bowls.

Name: Mul Polychrome: Manax Variety

Frequency: Five sherds of Mul Polychrome from Zacpetén are included in this study. This type comprises seven percent of the sherds in the Trapeche ceramic group and one percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: The Manax Variety of Mul Polychrome was first defined by Rice (1987a:146-149) based on Bullard's collection of pottery from Macanché Island. Chase (1979:110-112) defined a general the Mul Polychrome type from Tayasal pottery collections.

Types of analysis: "Low-tech" (5 sherds); petrographic (2 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Black painted decoration; 2) Cream to red exterior slip; 3) Gray snail inclusion paste; 4) Tripod dishes.

Paste and firing: Mul Polychrome pastes are typically gray (10YR 6/1to 2.5YR 5/1) with brown (10YR 6/2) to light brown (10YR 8/3) exterior oxidized margins. Estimated firing temperatures range from 550-600°C with a firing Mohs' hardness of 3. The clay matrix includes cryptocrystalline, euhedral, and subhedral calcite, quartz, hematite, shell, biotite, and chert.

Surface treatment and decoration: The exterior surfaces are slipped reddish yellow (7.5YR 6/6) to strong brown (7.5YR 5/6). Like the Trapeche Pink: Tramite Variety slips, Mul Polychrome exterior slips are double slipped with a creamy beige slip. However, unlike the Trapeche Pink: Tramite Variety sherds, these slips do have a matte finish. The slip is approximately .0625 mm thick and a Mohs' hardness of 2-3.

Interior surfaces are decorated. The decoration area is delineated by a black circumferential bands: one or two top bands and one black band along the wall/base juncture. The decorative elements are eroded.

Forms and dimensions: All Mul Polychrome: Manax variety sherds are from tripod dishes, but only two represent rims. The walls appear to be slightly flared. Both tripod dishes have a rim diameter of 22 cm and wall thickness ranges from 5.19-5.21 mm ($\bar{x}$=5.2 mm). Both sherds have direct rims: one direct rim has a rounded lip shape while the other is interiorly beveled.

Illustrations: Figure 25

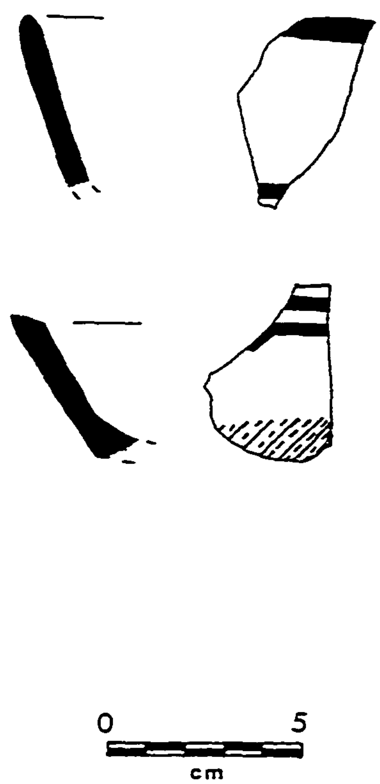


Figure 25: Mul Polychrome: Manax Variety Rim Profiles from Zacpetén.

Intrasite references: All of the Mul Polychrome: Manax variety sherds came from excavations at Zacpetén. Three sherds are from level 1 (humus) and level 2 (collapse) of Structure 719 (residence) and two are from the humus level of Structure 615 (open hall).

Intersite references: Mul Polychrome decorative technique and decorative characteristics are resemble those of Ixpop Polychrome: Ixpop Variety, Pastel Polychrome: Pastel Variety, and Pek Polychrome: Pek Variety. Although decoration elements are eroded, the four types have decoration areas that are delineated by black circumferential bands.

I examined Mul Polychrome sherds from Tayasal and Macanché Island. The sherds from Tayasal have double slipped "waxy" exteriors and some sherds have blackened rims. For the most part, the decoration areas are eroded, but circumferential bands remain.

Macanché Island has a rather large (n=155) collection of Mul Polychrome sherds. Unlike circumferential bands at other Postclassic sites in the Petén lakes area, the majority of the decorative panels at Macanché Island are single banded. The decorative paint at Macanché Island is a brownish red (2.5YR 3-4/2) (Rice 1987a:146) rather than black that occurs at other sites in the Petén lakes region. Forms at Macanché Island are similar to other sites; however, most tripod supports are cylindrical without vent holes. Rim diameters of tripod dishes range from 10-24 cm.

Outside of the Petén lakes region, black painted decoration with cream to tan slips occur. At Naco, a bichrome (Forastero Bichrome) is noted for its black-on-cream decoration (Wonderley 1981:182-186); however vessel forms are similar to those in the Petén lakes region. In northern Yucatán, Holactun Black-on-cream and Xcanchakan

Black-on-cream (Smith 1971:44-45) types are found at Uxmal, Kabah, Chichen Itzá, and Mayapán from A.D. 1000-1450.

Name: Picté Red-on-paste: Ivo Variety

Frequency: This description is based on one sherd from Zacpetén. Picté Red-on-paste: Ivo Variety comprises one percent of the Trapeche ceramic group and .1 percent of the sherds in this sample.

Ware: Volador Dull-Slipped ware.

Established: Present work based on collections from Zacpetén

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Unbanded red-on-paste decoration; 2) Yellowish-red slip; 3) Snail inclusion paste; 4) Tripod dish.

Paste and firing: Cryptocrystalline calcite dominates the light brown (7.5YR 6/3) to gray (2.5Y 6/1) pastes. In addition to cryptocrystalline calcite, quartz, hematite, euhedral and subhedral calcite, biotite, and chert occur in the clay matrix. The sherds are estimated to have been fired between 550-650°C and have a Mohs' hardness of 3.

Surface treatment and decoration: Exterior surfaces are slipped while the interior surface is decorated. Exterior slips are similar to those described for Trapeche Pink: Tramite Variety. The double slipped surfaces are yellowish red (5YR 5/6), with a matte finish. The slip is approximately .25 mm thick and has a Mohs' hardness of 3.

The interior rim and dish bases are the same color as the exterior slip. A primary pinkish white (5YR 8/2) slip with a Mohs' hardness of 3 occurs in the decoration area.

The decoration area is not banded. Decorations are too eroded to determine the decorative motifs, but portions of decorative paint in the decoration panel are yellowish red (5YR 5/6) and red (2.5YR 5/6).

Form and dimensions: Tripod dishes are represented by three sherds. The rim diameter of the tripod plate with a measurable rim is 28 cm and has an interiorly beveled lip shape. The wall thickness of the three sherds ranges from 6.72-8.91 mm ($\bar{x}$=7.84 mm).

Illustrations: Figure 26

Intrasite references: Picté Red-on-paste: Ivo Variety was found in two structures at Zacpetén: 615 (open hall) and 719 (residence). The sherd found in Structure 615 (open hall) was located in level 1 (humus) and the two sherds from Structure 719 (residence) were found in level 2 (collapse) and level 5 (below the last construction floor).

Intersite references: The red-on-paste unbanded decorations present on Picté Red-on-paste: Ivo Variety resembles those of Chompoxté Red-on-cream: Chompoxté Variety in that no evidence of banding exists.

This type does not appear at other sites in the Petén lakes region. Outside of the Petén lakes region, some possible correlates to Picté Red-on-paste: Ivo Variety exist: Mayapán's Tecoh Red-on-buff (Smith 1971:29) and Naco's Nolasco Bichrome (Wonderley 1981).

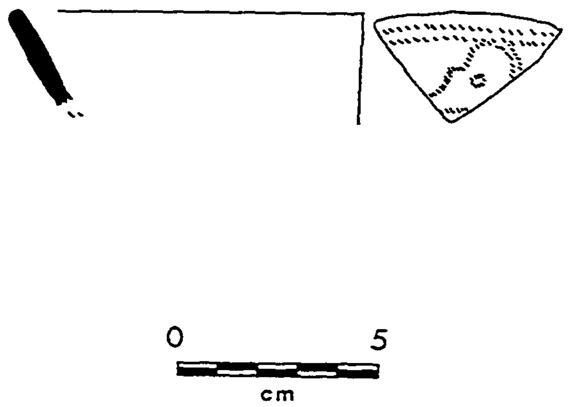


Figure 26: Picté Red-on-paste: Picté Variety Rim Profile from Zacpetén.

Name: Xuluc Incised: Tzalam Variety

Frequency: Four sherds (three from Zacpetén and one from Ixlú) are the basis for this description. Xuluc Incised: Tzalam Variety represents five percent of the sherds in the Trapeche ceramic group and one percent of the sherds in this study.

Ware: Volador Dull-Slipped ware.

Established: Rice (1987a:153-154) first described the Tzalam variety based on Bullard's pottery collection from Macanché Island. The general Xuluc Incised type was first described by Chase (1979:106-110) from his Tayasal pottery collection.

Types of analysis: "Low-tech" (4 sherds); petrographic (2 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal identifying modes: 1) Deep, prefire incising; 2) Light reddish brown to yellowish red slip; 3) Gray snail inclusion paste; 4) Grater bowls and drums.

Paste and firing: The gray (2.5Y 6/1) pastes have brown (10YR 5/3) oxidized margins that are approximately 3 mm wide. Estimated firing temperatures range from 550-600°C resulting in a core Mohs' hardness of 3. Cryptocrystalline calcite dominates the clay matrix with additional euhedral and subhedral calcite, shell, hematite, biotite, and quartz inclusions.

Surface treatment and decoration: Exterior surfaces are slipped light reddish brown (2.5YR 7/3) to yellowish red (7.5YR 6/4). The surfaces are double slipped and similar to other types in the Trapeche ceramic group. Slips are approximately .25 mm thick, have a low luster, and a Mohs' hardness of 2-3.

Interior walls are slipped and have the same characteristics as described for exterior surfaces. Slipping ends at the incisions that appear on the interior base of grater bowls. A single or double circumferential incision delineates the incised area that consists of vertical lines or crosshatching.

Drum sherds have vertical incisions. Incisions begin below the everted rim; however, the length of the incisions cannot be estimated due to their fragmentary nature. The incised area is not slipped, but the slip begins just below the vertical incisions.

Forms and dimensions: Two grater bowls and two drum fragments are the basis for this type definition. The grater bowl walls are taller than the tripod dish walls, have a slight curve, and an interior concave base. The one measurable grater bowl has a direct rim with a rounded lip shape is 28 cm in diameter. Wall thicknesses of all grater bowls range from 8.47-8.88 mm ($\bar{x}$=8.64 mm).

Although there are two drum sherds, only one has a rim. The everted direct rim has a diameter of 18 cm. Wall thickness ranges from 6.42-7.8 mm ($\bar{x}$=7.11 mm).

Illustrations: Figure 27

Intrasite references: The two grater bowls were found at Zacpetén. One was found in level 2 (collapse) of Structure 732 (residence) and the other was found in level 3 (floor) of Structure 719 (residence). One drum fragment was located in level 2 (collapse) of Structure 765 (residence) at Zacpetén. The other drum fragment was located in level 2 (collapse) of Structure 2034 (temple) at Ixlú.

Additional grater bowl fragments were excavated in levels 2 (collapse) and 3 (floor) of Zacpetén Structures 758 (residence) and 764 (temple). Grater bowls were also found in level 1 (humus) of Structure 2041 at Ixlú.

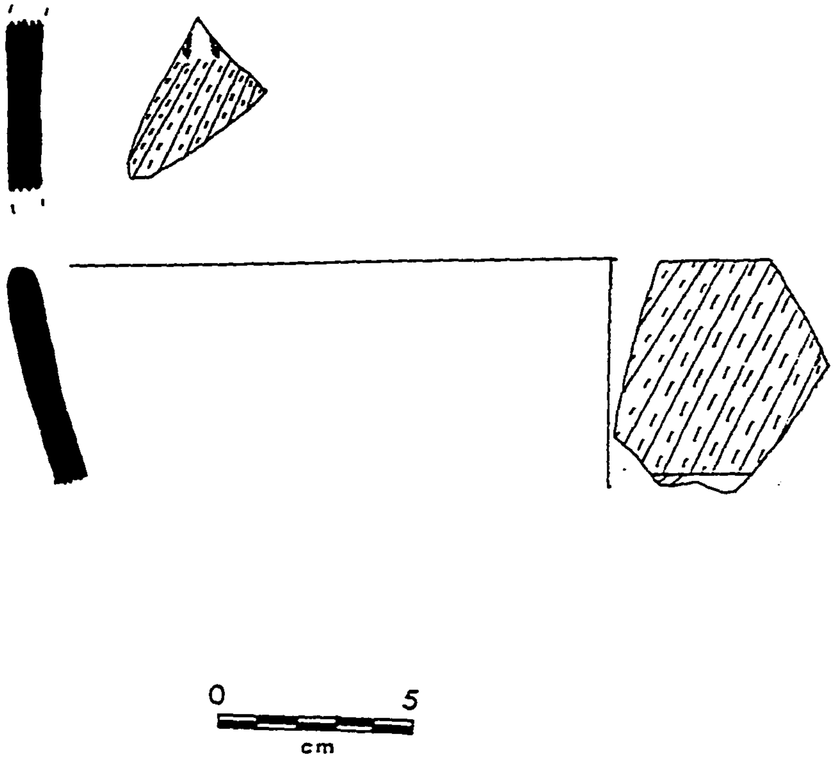


Figure 27: Xuluc Incised: Tzalam Variety Rim Profiles from Zacpetén.

Intersite references: Grater bowls and drums exist in all Postclassic slipped pottery types: Picú Incised: Thub Variety, Hobonmo Incised: Hobonmo Variety, Dulces Incised: Bebeto Variety, and Mengano Incised: Bobo Variety. The Trapeche ceramic group grater bowls and drums that I examined strongly resemble those of the Paxcamán ceramic group in form and dimension.

I also examined Xuluc Incised: Tzalam Variety grater bowls and drums excavated at Macanché Island. Slips resemble other Trapeche Pink double slipped sherds and black fireclouding is common. Gray pastes with snail inclusions predominate; however, one sherd paste is reddish brown and lacks shell inclusions. All but one grater bowl fragment demonstrates use.

Two drum sherds occur at Macanché Island. The vertical incisions with a length of 1 cm appear in groups of three on one rim and deep 3 cm incisions occur near the bolstered rim on the other drum sherd (Rice 1987a:153). "Pink" slip begins below the incisions.

Outside of the Petén lakes region, grater bowl and drum forms exist in northern Yucatán. Xuku Incised (Chichen Red ware), Pencuyut Incised: Pencuyut Variety (San Joaquin Buff ware), Xcanchakan Black-on-cream (Peto Cream ware), and Chichen Slate ware grater bowls resemble those found in the southern lowlands (Smith 1971:16,17, 27, 45). Postclassic drum forms occur in Mama Red (Mayapán Red Ware) and Tekit Incised (Puuc Slate) types (Smith 1971:22, 27).

As previously discussed, grater bowls occur in unslipped types and occur in Late Classic and Terminal Classic deposits in the Maya lowlands.

Augustine Ceramic Group

Name: Augustine Red: Augustine Variety

Frequency: The following description is based on 111 sherds: 40 from Zacpetén; 22 from Ixlú; 21 from Ch'ich'; and 28 from Tipuj. This constitutes 77 percent of the Augustine ceramic group and 20.18 percent of the sherds in this study.

Ware: Vitzil Orange-Red ware.

Established: R.E.W. Adams and Trik (1961:125-127) first established this type based on the Tikal ceramic collection. Chase (1979) defined the Vitzil Orange-red ware category.

Types of analysis: "Low-tech" (111 sherds); petrographic (60 sherds); x-ray diffraction (3 sherds); EDS and SEM and strong-acid extraction ICPS (17 sherds).

Principal identifying modes: 1) Red to red-orange slip; 2) Red to yellowish red carbonate paste; 3) Tripod dishes, bowls, collared jars, and medium high neck jars; 4) Effigy feet.

Paste and firing: Augustine Red paste colors range from red (2.5YR 5/6-2.5YR 5/8) to pale red (10YR 7/4) to yellowish red (5YR 5/6-5YR 5/8). While the majority of the sherds are completely oxidized, some sherds exhibit slightly lighter margins. The completely oxidized sherds were estimated to have been fired at 550-600°C. Those with lighter margins were estimated to have been fired to 300°C and when these sherds were refired to 800°C in an electric kiln, a dark gray margin appeared directly below the slip. The core hardness of all sherds is 3 on the Mohs' hardness scale.

The Augustine Red carbonate pastes include euhedral and subhedral calcite, quartz, hematite, biotite, and chert. Two different clusters based on inclusions occur in the present samples of Augustine Red sherds. The first is a clay matrix with very few inclusions (< 5%) and dominated by voids. The second paste group consists of the inclusions listed above and few voids.

Surface treatment and decoration: A red (2.5YR 4/6, 2.5YR 5/8, 10R 4/6) to pale red (10R 6/4) slip covers the interior and exterior surfaces of Augustine Red: Augustine Variety sherds. The slip is approximately .25 mm thick and has a Mohs' hardness of 2-3. Most of the sherds exhibit a well preserved slip that has a low luster to an almost glossy finish. Few sherds have a matte finish and are eroded. Sherds from Zacpetén and Ixlú have black or tan fireclouds whereas sherds from Ch'ich', Tipuj, and Zacpetén (a very small number) have tan fireclouds. Fireclouding typically occurs on dish bases. The different fireclouding colors may be the result of differential access of oxygen to the slip, mineral differences in slips, and/or technological choices made by the Postclassic Maya.

Forms and dimensions: Augustine Red: Augustine Variety takes many forms that include tripod dishes (n=20), restricted orifice bowls (n=4), collared jars (n=20), and narrow neck jars (n=17). Tripod dish rim diameters range from 20-30 cm ($\bar{x}$=25.5 cm) with wall thicknesses of 5.2-9.64 mm ($\bar{x}$=6.63 mm); rims are direct with rounded, interiorly beveled, and pointed lip shapes. Walls are slightly flared, the dishes have flat bases, and tripod supports take many forms. The two most common tripod support forms are the scroll foot and the cylinder foot with round vent holes, but effigy and bulbous supports with vertical or diagonal vent holes also occur in the collection.

Bowl rim diameters range from 12-25 cm ($\bar{x}$=19.25 cm) and wall thicknesses are 4.91-7.90 mm ($\bar{x}$=6.47 mm). The direct rims have rounded or pointed lip shapes.

Collared jar rim diameters vary between 19-36 cm ($\bar{x}$=26.15 cm). Wall thicknesses are 4.75-10.16 mm ($\bar{x}$=6.89 mm). Direct rims have rounded and interiorly beveled lip shapes.

Medium high neck jar rim diameters range from 14-34 cm ($\bar{x}$=20.82 cm) with wall thicknesses of 5.3-8.5 mm ($\bar{x}$=7.12 mm). Although the majority of jar necks are vertical, some are outcurving. Direct rims have rounded, interiorly beveled, everted, and exteriorly thickened lip shapes.

Illustrations: Figures 28, 29, and 30

Intrasite references: The red slip of Augustine Red sherds is part of the same tradition as that of Paxcamán Red and Topoxté Red types and other Maya lowland red monochrome slipped types. Augustine Red slips from Tayasal and Tipuj are fairly thick with a low luster to "waxy" finish that resembles that of the Preclassic Sierra Red type.

Augustine Red sherds occur at Zacpetén, Ixlú, Ch'ich', and Tipuj. Tipuj has the highest quantity (by frequency and weight) of these sherds. Augustine Red: Augustine Variety sherds were found in all five excavated Postclassic structures and in all levels of Complex 1 at Tipuj. At Ixlú, Augustine Red sherds came from the following structures: 2003 (domestic), 2006 (domestic), 2022 (open hall), 2034 (temple), and 2041 (residence). All but 6 sherds were located in the first three levels (last occupation) and the remaining sherds were located in fill layers below the first floor and above the second floor.

In addition to the sherds described above, all Zacpetén structures except 664 (residence) have Augustine Red sherds. At Ixlú, Structures 2017 (open hall), 2021 (open

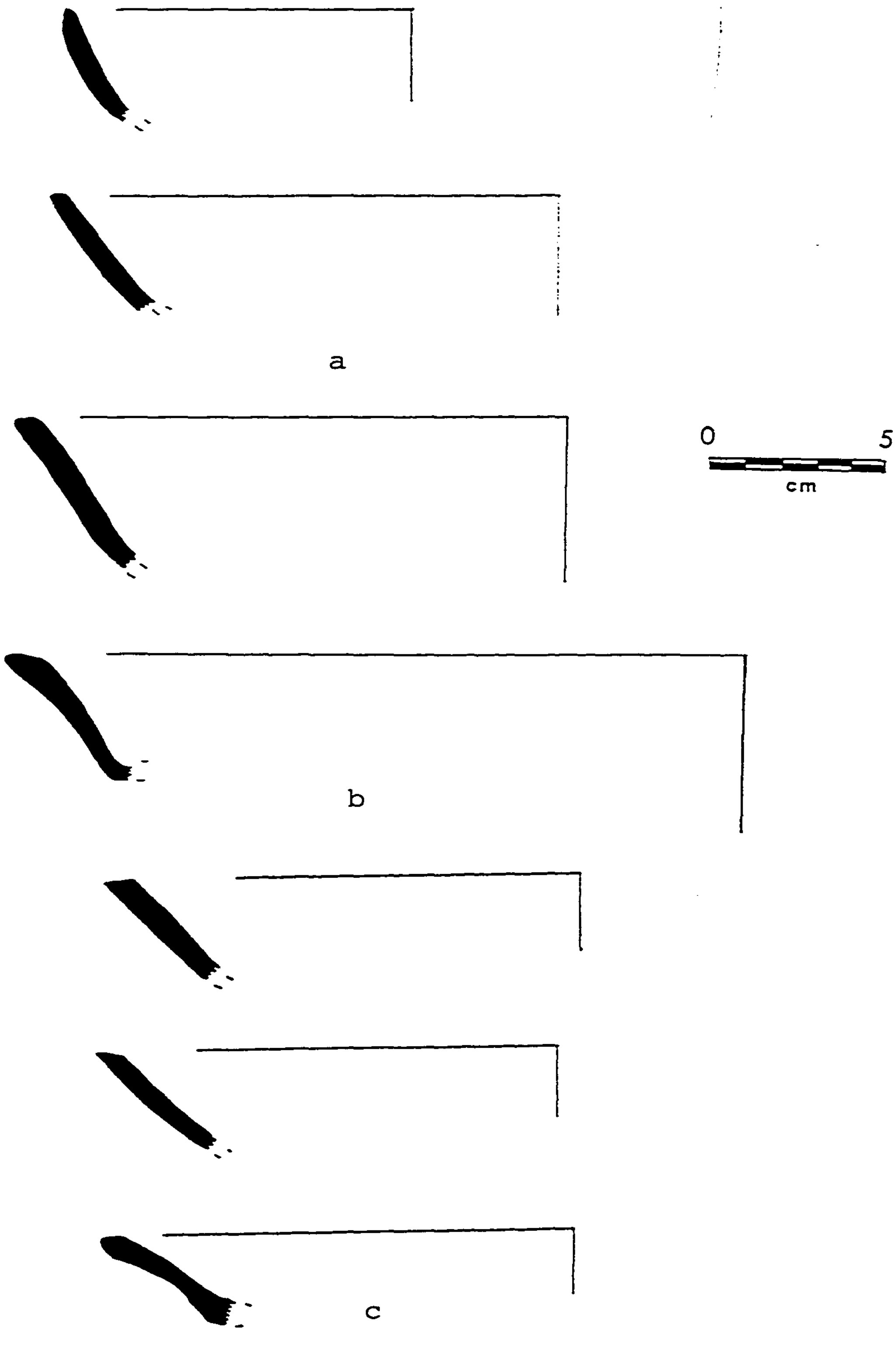


Figure 28: Augustine Red Tripod Plate Rim Profiles from Ixlú (a), Ch'ich' (b), and Tipuj (c).

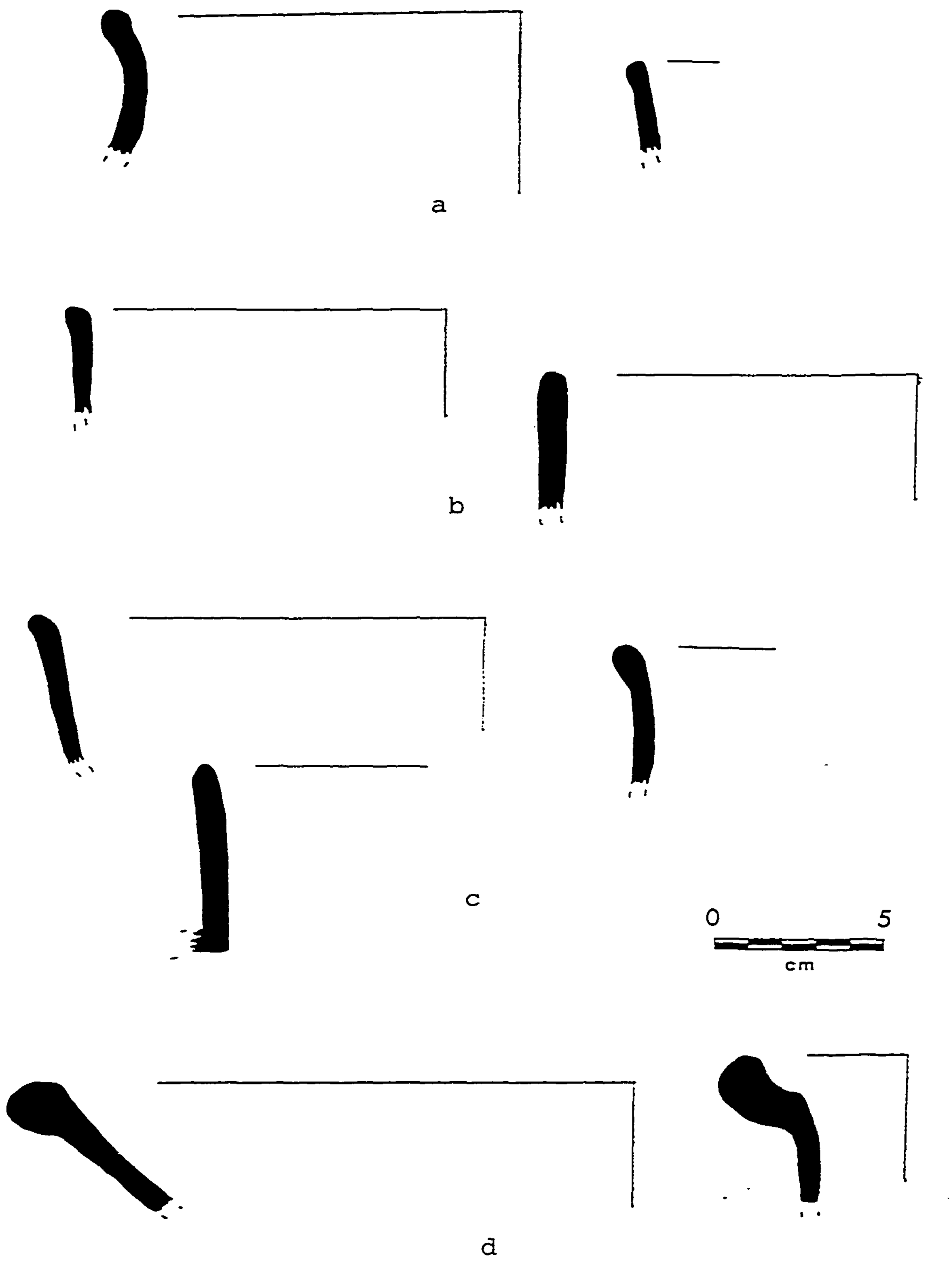


Figure 29: Augustine Red Jar Rim Profiles from Zacpetén (a), Ixlú (b), Ch'ich' (c), and Tipuj (b).

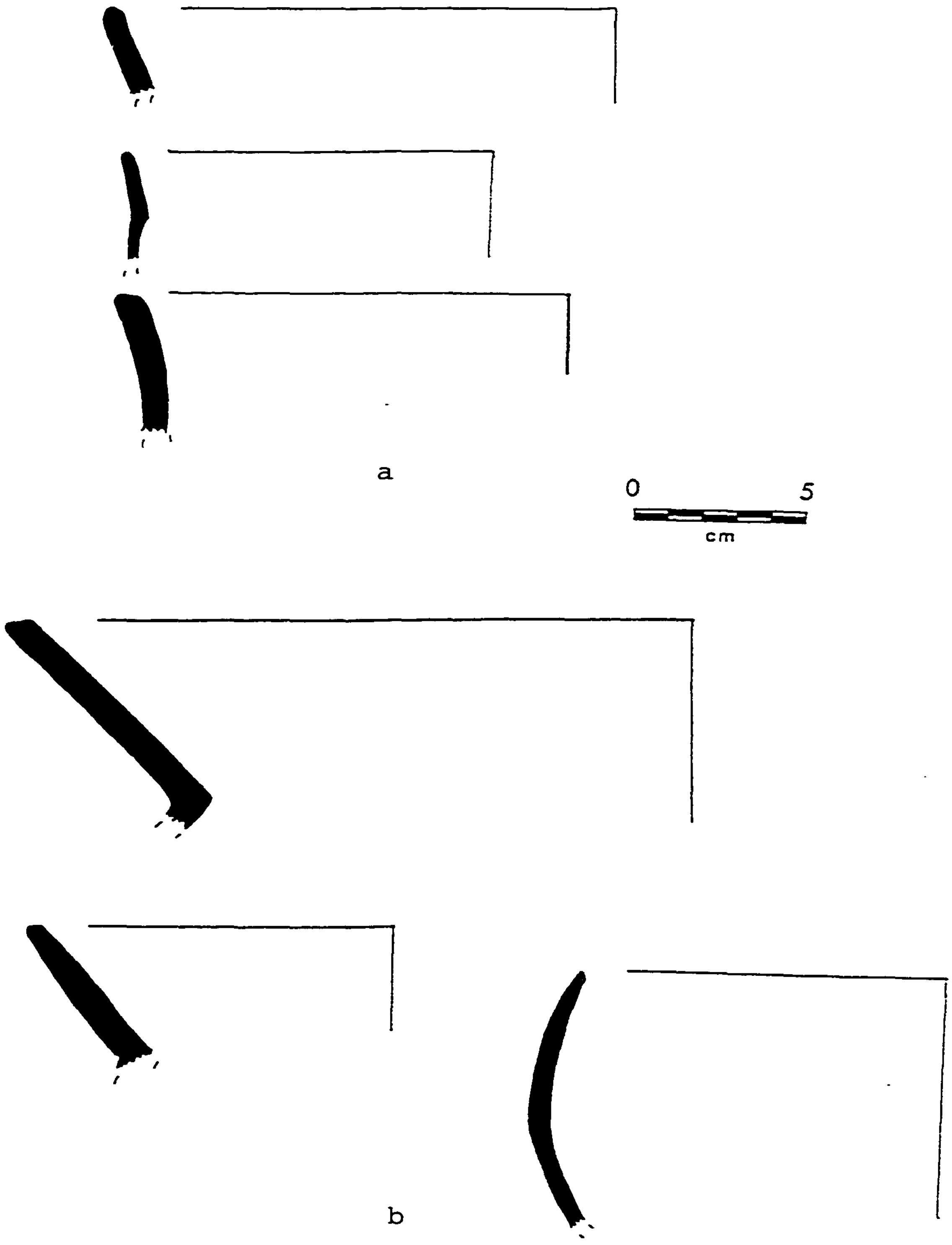


Figure 30: Augustine Red Miscellaneous Rim Profiles from Zacpetén (a) and Tipuj (b).

hall), and 2023 (temple) also included Augustine Red sherds.

Intersite references: I examined Augustine Red sherds from Tayasal and Macanché Island. The majority of Postclassic sherds from Tayasal are of this type. Paste colors from Tayasal vary from orangish red to half orangish red and half tan to completely tan. Tan pastes occur where slips have tan fireclouds. The same pattern is present at Tipuj. Slips at Tayasal are red (10R 4/6), fairly thick, and have a low luster. For the most part, the slip characteristics are similar to those at Tipuj; however, paste colors vary. Collared bowls, tripod dishes, jars, and restricted orifice jars occur at Tayasal. Rim diameters in all form classes are similar to those described above. Excavations by individuals from the town of San Miguel (the modern city constructed over the archaeological site of Tayasal) for modern lakeside residences in 1996 yielded an enormous amount of supports. Effigy forms dominated, but scroll, cylinder, and bulbous forms also occurred.

Although Augustine Red sherds appear at Macanché Island, they do not occur in the large quantities similar to Tayasal and Tipuj. Paste and slip characteristics resemble those described for Tayasal, but black and tan fireclouding occurs. Tan fireclouded areas resemble Trapeche Pink double slips. Some exterior slips may have been double slipped, as judged from the presence of a cloudy cream overslip with a low luster. This may be a double slip or the result of post-depositional alteration, but unlike Topoxté Red sherds described below, the creamy overslip also has a low luster finish.

In addition to Tayasal and Macanché Island, the Quexil Islands, Tikal, and Flores Island also have Augustine Red sherds. Rice (1987a:167) notes that CPHEP excavations at Lake Quexil revealed a significant quantity of Augustine Red sherds. Augustine sherds from Tikal come from excavations in Temple 1 (Adams and Trik 1961:125-127).

Cowgill (1963:76-85) description of the Augustine sherds from Flores Island leads me to believe that the "red" paste colors he describes are similar to those from Tayasal, Ch'ich', and Zacpetén and slips he describes resemble those of Tipuj because of the orange red color, tan fireclouds, and the "waxy" finish. Forms include tripod dishes with scroll and effigy supports, bowls, restricted orifice bowls, and low, medium, and high neck jars. Rim diameters are within the range described for other sites in the Petén lakes region.

Outside of the Petén lakes region, Augustine Red sherds appear at Barton Ramie (Sharer and Chase 1976:291-293) and Colhá (Valdez 1987:212, 216). The sagging bottom tripod dish with effigy supports form is not seen in the Petén lakes region, but the Barton Ramie effigy supports resemble those from Tipuj and Tayasal. The pink orange paste and "waxy" red slip described by Sharer and Chase (1976:293) is similar to pottery at Tipuj. Sharer and Chase (1976:293) state that these sherds may be earlier than those in the Petén lakes region.

Valdez (1987:216) notes the presence of a tripod dishes with scroll and bulbous supports.

Name: Pek Polychrome: Pek Variety

Frequency: The following Pek Polychrome description is based on 17 sherds: two from Ch'ich'; three from Ixlú; six from Zacpetén; and six from Tipuj. This sample constitutes 12 percent of the Augustine ceramic group and 3.09 percent of the total sherds in this study.

Ware: Vitzil Orange-Red ware

Established: Cowgill (1963:76) first described Pek Polychrome: Pek Variety based on ten sherds from his Lake Petén Itzá collection.

Types of analysis: "Low-tech" (17 sherds); petrographic (11 sherds); x-ray diffraction (1 sherd); EDS and SEM and strong-acid extraction ICPS (7 sherds).

Principal identifying modes: 1) Black painted decorations; 2) Red slip; 2) Red to yellowish red carbonate paste; 4) Tripod dishes, bowls, collared jars, and narrow neck jars.

Paste and firing: Paste colors are red (2.5YR 5/8, 4/8) to yellowish red (5YR 6/4, 5/6). All but three sherds are well oxidized; however, when all of the sherds were refired to 800°C, over two-thirds of the sample exhibited a black margin below the slip. These sherds have an estimated firing temperature of 300°C and the remaining one-third of the sample has an estimated firing temperature of 550-600°C. Core hardness for all sherds is 3 on the Mohs' hardness scale.

All but two sherds from Ixlú have a clay matrix that is dominated by cryptocrystalline calcite. Subhedral and euhedral calcite, hematite, quartz, chert, and biotite are also in the clay matrix. The remaining two sherds from Ixlú have a clay matrix that is predominantly angular voids with a few (< 2 percent) chert, quartz, and hematite inclusions.

Surface treatment and decoration: Exterior slips are red (10R4/6, 4/8, 2.5YR 4/6, 4/8) and the majority have a low luster finish. The remaining sherds are fairly eroded and have a matte finish. Slip thicknesses vary from .125-.375 mm with a Mohs' hardness of 2-3. Although uncommon, black fireclouding occurs on rims.

Pek Polychrome: Pek Variety interior surfaces are decorated with black (7.5YR 3/1, 5YR 3/1, 2.5Y 2.5/1) line bands and decorative elements. The black decorations are painted over a light red (2.5YR 7/8) primary slip. Decoration areas have either double or single top and bottom circumferential bands. One sherd, a possible bowl from Ixlú, has a quadruple upper circumferential band. Decorations are highly eroded, but where discernible, hooks, plumes, curvilinear lines, and mat motifs occur on Pek Polychrome: Pek Variety sherds.

Form and dimension: Black line decorations appear on tripod plates (n=7), collared jars (n=2), and narrow neck jars (n=1). Tripod plates have slightly outcurving walls, flat bases, and direct rims with pointed, rounded, and interiorly beveled lip shapes. Rim diameters range from 24-44 cm ($\bar{x}$=27.86 cm) and wall thicknesses of 5.01-7.89 mm ($\bar{x}$=6.85 mm).

Two tripod plates have basal flanges. The flanges are composed of two steps on both the right and left sides. The first step has a height of 5.20 mm and the second step has a height of 4.68 mm. Rim diameters are 28 cm and 30 cm ($\bar{x}$=29 cm) with wall thicknesses of 6.65 mm and 8.83 mm ($\bar{x}$=7.49 mm). The direct rims are rounded and squared.

Collared bowl necks are outflaring and the direct rims have rounded and interiorly beveled lip shapes. Rim diameters range from 24-32 cm ($\bar{x}$=28 cm) and wall thicknesses of 5.14-5.22 mm ($\bar{x}$=5.18 mm).

One sherd represents a medium high-necked jar with a neck height of 5.5 cm. The jar rim diameter is 24 cm and a wall thickness of 7.90 mm. The direct rim is rounded.

Illustrations: Figure 31

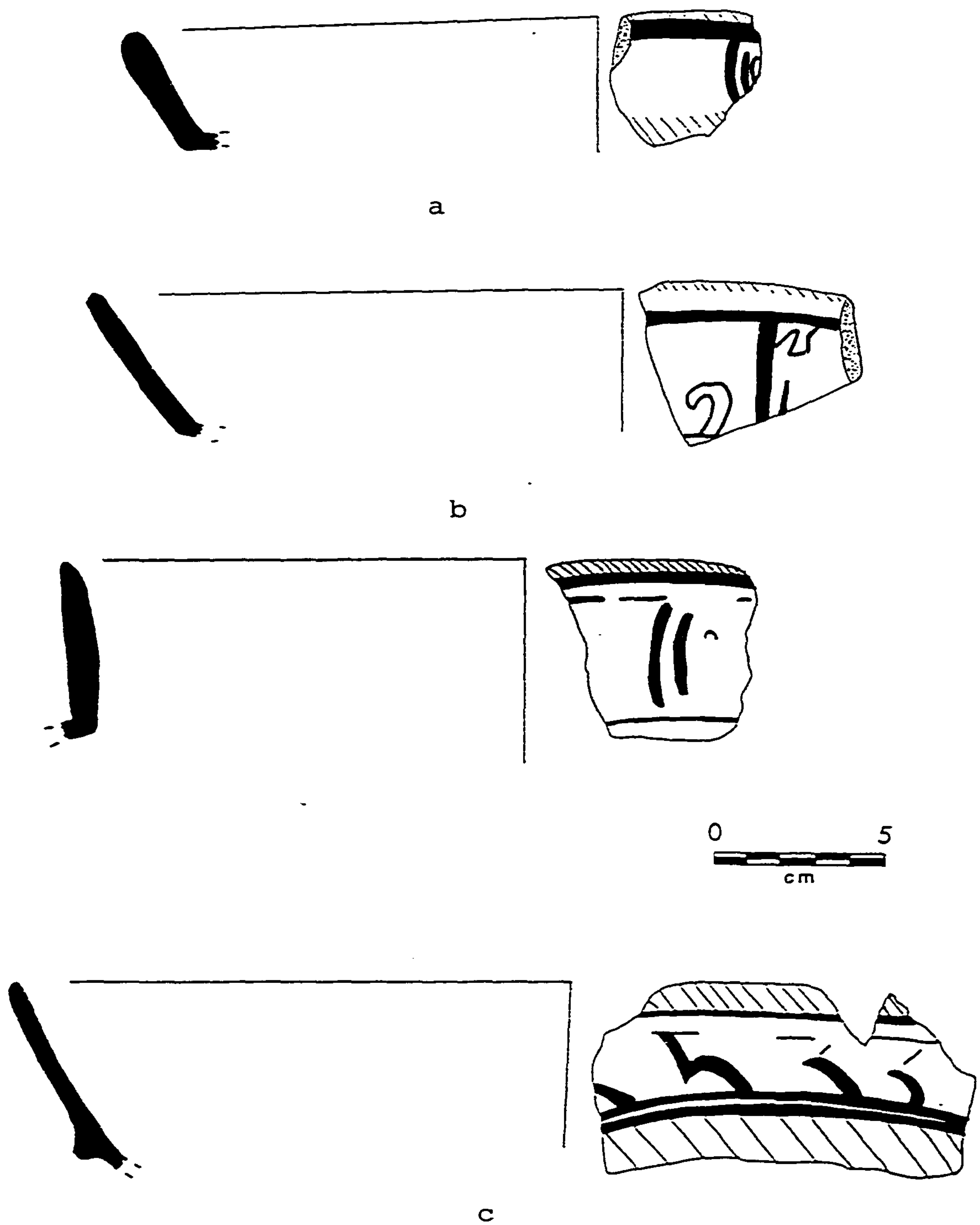


Figure 31: Pek Polychrome Rim Profiles from Zacpetén (a), Ch'ich' (b), and Tipuj (c).

Intrasite references: All Pek Polychrome: Pek Variety sherds in this study were found in the first two levels of excavation (humus and collapse). At Ch'ich' all sherds come from Structure 188. Pek Polychrome sherds from Ixlú were found in Structure 2034 (range structure). Sherds from Zacpetén come from Structures 606 (an open hall)and 767 (an open hall). Structures 1 (oratorio) and 2 (temple) and the Complex 1 plaza floor at Tipuj had Pek Polychrome sherds.

Additional Pek Polychrome sherds come from Zacpetén Structures 605 (oratorio), 614 (oratorio), and 719 (residence) and Structures 4 and 5 (open halls) at Tipuj.

Intersite references: Pek Polychrome resembles other black painted decorative types in the Petén lakes region such as Ixpop Polychrome, Mul Polychrome, and Pastel Polychrome. Tayasal and Flores Island are the only other sites in the Petén lakes region to have Pek Polychrome sherds.

Pek Polychrome sherds that I examined from Tayasal have tan to orange pastes and the exterior slip is red similar to that described above. The decoration areas have a lighter color primary slip that is delineated by two or three top circumferential bands. Unfortunately, all other elements of the decoration are eroded.

Cowgill (1963:83) compared Pek Polychrome sherds from Flores Island to Ixpop Polychrome sherds. Unfortunately, he grouped Pek Polychrome with Augustine Red sherds and did not provide a description or drawings.

Barton Ramie and Colhá are the only sites outside of the Petén lakes region that have Pek Polychrome sherds. As at other sites, Pek Polychrome sherds are rare–only 10 at Barton Ramie (Sharer and Chase 1976:294). Some decorations do, however, differ from those in the Petén lakes region. There are at least two cases where the decoration is negatively painted. The negative and positively painted decorations are on top of a lighter orange primary slip and are defined by two upper and one lower circumferential bands. Rim diameters are also smaller (20-38 cm) than those from Ch'ich', Ixlú, Zacpetén, and Tipuj.

Valdez (1987:217-218) states that Colhá excavations produced three Pek Polychrome sherds. The interior decorated surfaces are slipped orange (perhaps a primary slip) with black painted decoration.

In addition to Barton Ramie and Colhá, black painted decoration that is similar to Ixpop Polychrome occurs in northern Yucatán as Mama Red: Black-on-unslipped Variety Polychrome (Mayapán Red ware) (Smith 1971:22-23).

Name: Graciela Polychrome: Graciela Variety

Frequency: The following Graciela Polychrome description is based on three sherds from Zacpetén. Graciela Polychrome: Graciela Variety comprises two percent of the Augustine ceramic group and .55 percent of the total sherds in the study.

Ware: Vitzil Orange-Red ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (3 sherds); petrographic (2 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (1 sherd).

Principal identification modes: 1) Red and black painted decoration; 2) Red exterior slip; 3) Light reddish brown to reddish yellow carbonate paste; 4) Tripod dishes, flanged tripod dishes, and collared jars.

Paste and firing: Graciela Polychrome: Graciela Variety pastes are light reddish brown (5YR 6/4) to reddish yellow (5YR 6/6) in color. The pastes are well oxidized and two are estimated to have been fired to 300°C while the third is estimated to have been fired to 700°C. Core hardness is 3 on the Mohs' hardness scale.

Graciela pastes are dominated by cryptocrystalline calcite. Additional minerals in the clay matrix include euhedral and subhedral calcite, quartz, hematite, and biotite.

Surface treatment and decoration: Exterior surfaces and the interior lip are slipped red (2.5YR 4/8). The slip finish is generally a low luster, but one eroded sherd has a matte finish. One sherd has single-step basal flanges that are slipped. Slip thickness is approximately .25 mm, with hardness of 2-3.

Interior surfaces are decorated. Black (5YR 3/1) and red (7.5R 4/6) decorations are painted on top of a reddish yellow (7.5YR 6/6) primary slip. The decoration area is delineated by red and black circumferential bands. The top series of bands has either four bands (black then red then red then black) or two bands (red then black). Only one sherd has a single bottom black band. Although, decorative elements are eroded, a curvilinear line occurs on one sherd.

Form and dimension: This Graciela Polychrome: Graciela Variety description is based on three form types: a tripod dish, a flanged tripod dish; and a collared jar. The tripod dish has slightly flared walls and a direct rim with a squared lip shape. The rim diameter is 28 cm with a wall thickness of 7.88 mm.

The flanged tripod dish sherd is a body sherd. The wall thickness is 6.64 mm and the flange height is 4.76 mm.

The third sherd represents a collared bowl with a flared neck. The rim diameter is 28 cm with a wall thickness is 7.91 mm. The direct rim has a square lip shape.

Illustrations: Figure 32

Intrasite references: The three sherds that are examples of this type were found in levels 1 and 2 (humus and collapse) of Structure 719 (a residence) at Zacpetén. Graciela Polychrome sherds also appear in Structure 767 (open hall) at Zacpetén and Structure 2 (temple) at Tipuj.

Intersite references: Graciela Polychrome's red and black painted decoration patterns can also be seen in the Canté Polychrome, Sacá Polychrome, and Dolorido Polychrome types. All of the types have a series of red and black circumferential bands with either red and/or black decorative motifs. Unfortunately, the decorative elements described above are eroded and do not permit intersite comparisons.

This type does not exist outside of the Petén lakes area. However, Pele Polychrome jars of the San Joaquin Buff are at Mayapán may be similar in that they are decorated with red and black painted decorations (Smith 1971:229).

Name: Hobonmo Incised: Ramsey Variety

Frequency: This description is based on five sherds: two from Zacpetén and three from Tipuj. The five sherds comprise three percent of the Augustine ceramic group and .91 percent of the total sherds in this sample.

Ware: Vitzil Orange-Red ware

Established: Chase (1983) first described Hobonmo Incised: Ramsey Variety based on a pottery collection from Tayasal.

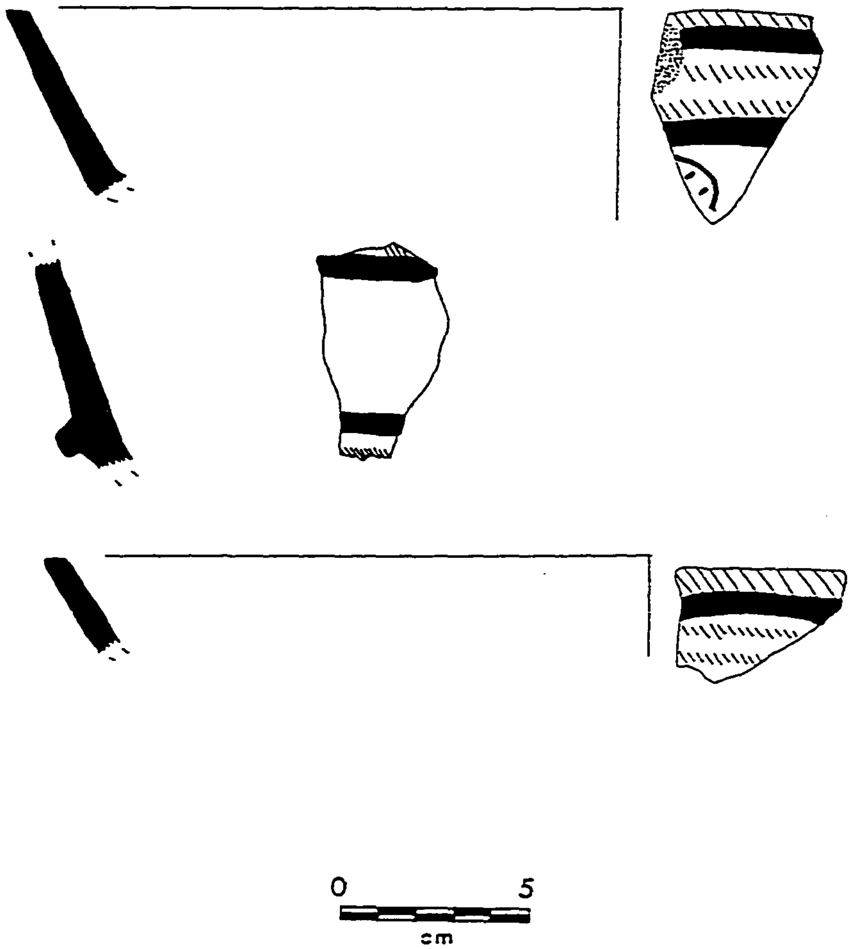


Figure 32: Graciela Polychrome: Graciela Variety Rim Profiles from Zacpetén.

Types of analysis: "Low-tech" (5 sherds); petrographic (2 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (2 sherds).

Principal identifying modes: 1) Pre- or post-fire fine line incising; 2) Red slip; 3) Red to brown carbonate paste; 4) Tripod dishes, collared jars, and short neck jars.

Paste and firing: Paste colors range from red (2.5YR 5/8, 4/8, 5YR 5/6) to brown (10YR 5/3). All but one sherd is completely oxidized and estimated firing temperatures range from 300-800°C. The sherd that was fired to an estimated 300°C has a darker core. The sherd that was fired to and estimated 800°C has a red paste that is dominated by calcite to such an extent that the paste color appears almost white. Core hardness is 3 on the Mohs' hardness scale.

All Hobonmo Incised: Ramsey Variety sherd clay matrices are dominated by cryptocrystalline calcite. In addition to the cryptocrystalline calcite, subhedral and euhedral calcite, quartz, hematite, and chert occur in the clay matrix.

Surface treatment and decoration: Sherds are slipped red (2.5YR 5/6, 4/8, 7.5R 4/6, 10R 4/6). The slip is .125-.25 mm thick with a Mohs' hardness of 2-3. Exterior surfaces of tripod dishes, and exterior and interior neck surfaces of collared jars and narrow neck jars are slipped red. Better preserved sherds have a glossy finish while poorly preserved sherds have a low luster to matte finish.

Collared jars are incised on the exterior surfaces. Post-fire, fine line incising begins below or at the neck/shoulder junction. Single upper and lower circumferential bands delineate the decoration. In this case, the decoration is paneled by two vertical lines. The decorative motif is an *ilhuitl* glyph.

The short neck jar is slipped on the exterior and is incised on the interior neck.

The mat motif is delineated by two top and bottom circumferential bands. A decoration below the bottom band exists, but the sherd is broken below that point.

The tripod dish is incised on an interior surface that does not appear to have a primary slip. The fine line, pre-fire incised area is encompassed by a single black painted circumferential band. A decoration of plumes and circles is paneled by two vertical incised lines.

Form and dimension: Hobonmo Incised: Ramsey Variety appears on tripod dishes (n=1), collared jars (n=1), and short neck jars (n=1). The tripod dish has slightly outcurving walls and a direct rim with a rounded lip shape. The rim diameter is 24 cm and the wall thickness is 6.43 mm.

The collared jar has a flared neck and a direct rim with a interiorly beveled lip shape. The rim diameter is 18 cm with a wall thickness of 5.03 mm.

The short neck jar's neck height is 3.1 cm. The direct rim has a rounded lip shape. The jar's rim diameter is 24 cm with a wall thickness of 4.75 mm.

Although not included in the sample for the above description, some flanged collared jars and/or bowls have flanges that are decorated with vertical incisions.

Illustrations: Figure 33

Intrasite references: The two sherds from Zacpetén come from level 2 of Structure 764 (a temple) and 606 (an open hall). The three sherds from Tipuj were found in the first two levels of excavation (humus and collapse) in Structures 2 (temple) and 3(open hall). Hobonmo Incised: Ramsey Variety sherds were also located in Structure 1 (oratorio) at Tipuj.

Intersite references: Fine line post-fire incising is common in all Postclassic

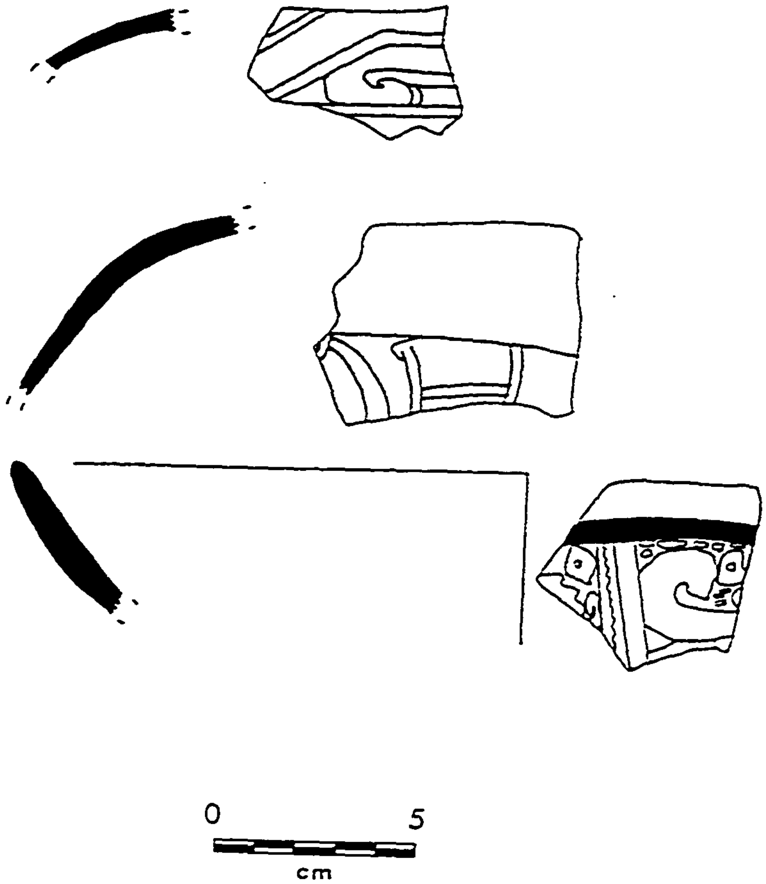


Figure 33: Hobonmo Incised: Ramsey Variety Rim Profiles from Tipuj.

slipped ceramic groups and includes the following types: Picú Incised: Picú Variety, Xuluc Incised: Ain Variety, Dulces Incised: Dulces Variety, and Mengano Incised: Mengano Variety. Decoration boundaries are defined in all groups by one to three top and bottom circumferential bands. For the most part, the decoration complex of the various types is similar, except Hobonmo Incised: Ramsey Variety has an added motif: the *ilhuitl* glyph.

I examined Hobonmo Incised: Ramsey Variety sherds from Tayasal. The incised sherd has circles and diagonal small lines. The coarse paste has a darker red color than most other Augustine group ceramics from Tayasal.

Outside of the Petén lakes area, incised decoration is common. At Barton Ramie, the closest analogy to Hobonmo Incised: Ramsey Variety is Mauger Gouged-incised: Mauger Variety. This type name implies gouging which does not appear on Petén lakes slipped Postclassic pottery. However, the intersite descriptions provided by Sharer and Chase (1976:293-294) draw comparisons to Pico [sic.] Incised of the Paxcamán ceramic group. The same Mauger Gouged-incised: Mauger Variety occurs at Colhá (Valdez (1987:216-217).

According to Graham (2000, personal communication) and Rice (1999, personal communication) the incised *ilhuitl* glyph occurs at Lamanai which may suggest ties/contact between Tipuj and Lamanai. (The *ilhuitl* glyph also occurs on two examples of Paxcamán painted pottery.) In addition to Postclassic pottery at Lamanai, the *ilhuitl* glyph is common at Tulum and Tancah (Sanders 1960). Incised types at most archaeological sites in northern Belize and northern Yucatán are more common than polychrome types. Therefore, it would not be surprising to observe stylistic connections between the northern and southern Maya lowlands. Decorative motifs, such as scrolls, mats, hooks, and stepped frets, at Mayapán are similar to those seen in the Petén lakes region (Smith 1971:48-67).

Name: Hobonmo Incised: Hobomno Variety

Frequency: Seven sherds comprise this description: two from Ch'ich', two from Ixlú, and three from Tipuj. Hobonmo Incised: Hobonmo Variety comprises five percent of the Augustine ceramic group and1.27 percent of the total sherds in the study.

Ware: Vitzil Orange-Red ware

Established: Chase (1983) established this type and variety based on pottery collections from Tayasal.

Types of analysis: "Low-tech" (7 sherds); petrographic (4 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (2 sherds).

Principal identifying modes: 1) Pre-fire wide- line incisions; 2) Red slip; 3) Reddish yellow to light reddish brown carbonate paste; 4) Drums and grater bowls.

Paste and firing: Paste colors range from reddish yellow (5YR 6/6) to light reddish brown (10YR 6/4). Half of the sherds are oxidized throughout, with the remaining having light brownish gray (10YR 6/2) margins. All of the sherds but one were estimated to have been fired between 450-750˚C . The remaining sherd was fired to an estimated 300˚C. The low fired sherds (with estimated firing temperatures below 500°C) produced a black core just below the slip surface when fired to 400˚C in an electric kiln. Core hardness is 3-4 on the Mohs' hardness scale.

Two different clay matrices occur in this group. The first group has abundant voids and with approximately 15% of the clay matrix being quartz, biotite, ferruginous lumps (hematite), and cryptocrystalline calcite. The second group is dominated cryptocrystalline calcite with 20% of the clay matrix consisting of quartz, chert, ferruginous lumps (hematite), chert, and subhedral and euhedral calcite.

Surface treatment and decoration: Exterior and interior surfaces are slipped red (2.5YR 5/8,4/8, 10R 4/8, 7.5R 4/8). Some slips have a low luster and occur mainly on grater bowls. Drum sherds, on the other hand, tend to have a matte finish. Black fireclouds occur near rims and on bowl walls. Slip hardness is 2-3 on the Mohs' hardness scale.

Grater bowls are incised on the interior base of the bowl. The pre-fire deep incising appears as parallel lines that are bounded by one or two circumferential bands. Slip remains on the incised area, suggesting that incisions were made before the vessels were slipped.

Drums have a series of vertical incisions that begin below the vessel's exteriorly thickened or folded rim. Length of the incisions varies between 1.50-3.00 cm and they occur in groups of three. The incised area is not slipped, but slip does begin 1-3 cm below the incisions.

Form and dimensions: Grater bowls (n=3) and drums (n=4) appear with wide line, pre-fire incising. Grater bowls are represented in this study by bowl base fragments that are slightly concave. Base thicknesses range from 4.82-5.01 mm ($\bar{x}$=4.92 mm).

All but one drum sherd is represented by vertical walls that have exteriorly thickened direct rims. Although there are five drum sherds, only one has a measurable rim with a diameter of 16 cm. One drum sherd has a direct rim with a rounded lip shape.

Wall thicknesses range from 8.16-10.21 mm (mean=8.72 mm).

Illustrations: Figure 34

Intrasite references: All sherds described above were located on or above the latest floor (levels 1-3). Sherds from Ch'ich' came from Structure 188 (open hall), sherds from Ixlú came from Structure 2034 (temple), and sherds from Tipuj came from Structures 1 (oratorio) and 2 (temple).

In addition to the above locations, drum fragments were excavated from Structure 2 (temple) at Tipuj. Additional grater bowl fragments were located in Structure 719 (residence), Structure 748 (unknown), and Structure 764 (temple) at Zacpetén, Structures 2023 (temple) and 2041(residence) and Ixlú and Structure 3 (open hall) at Tipuj.

Intersite references: Grater bowls and drums exist in all Postclassic slipped pottery types: Picú Incised: Thub Variety, Xuluc Incised: Tzalam Variety, Dulces Incised: Bebeto Variety, and Mengano Incised: Bobo Variety. Grater bowls with tripod supports are similar among the types, but drum rim forms differ. For example, Dulces Incised: Bebeto Variety has straight walled jar necks while Hobonmo Incised: Hobonmo Variety have everted rims and some are exteriorly thickened. All drums have incising below the rim. Smith (1971:77) suggests that the incisions were added for traction for the cloth that was placed over the opening. Although this may be the case, Hobonmo Incised drums have incisions that occur in groups separated by non-incised areas. This may suggest that the incisions held a dual role: traction and decoration.

Hobonmo Incised: Hobonmo Variety occurs at Tayasal and Flores Island. I examined grater bowl sherds from the Tayasal collection. The outer one-half portion of the sherd paste is tan. This type of oxidation resembles the sherd cores common at Tipuj

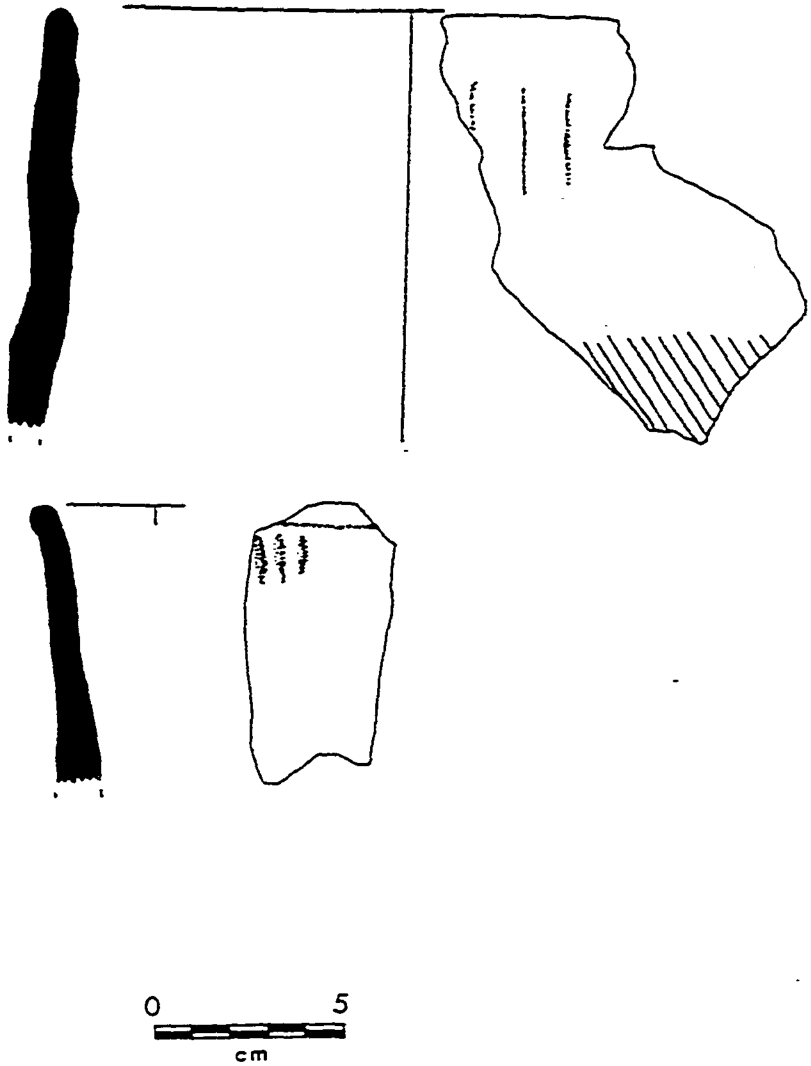


Figure 34: Hobonmo Incised: Hobonmo Variety Rim Profiles from Tipuj.

and in the Augustine Red types described above. The sagging bottom bowls have bulbous supports that are hollow and have vertical slashes. All of the examples in Chase's collection at the University of Cental Florida show use wear. In addition to grater bowls, a possible drum fragment also exists. The fragment is small and undiagnostic as to form and lip shape.

Cowgill (1963:84, Figure 2g) notes the presence of two grater bowls with cross-hatching on the interior base on Flores Island.

No other examples of Hobonmo Incised: Hobonmo Variety exist outside of the Petén lakes region. However, grater bowls and drums with a similar shape exist in northern Yucatán. Xuku Incised (Chichen Red ware), Pencuyut Incised: Pencuyut Variety (San Joaquin Buff ware), Xcanchakan Black-on-cream (Peto Cream ware), and Chichen Slate ware have grater bowl forms that resemble those found in the southern lowlands (Smith 1971:16,17, 27, 45). Grater bowls and drum also occur in Late/Terminal Classic contexts at Uaxactún (Smith 1955).

Name: Johnny Walker Red: Black Label Variety

Frequency: This description is based on one sherd from Tipuj. Johnny Walker Red: Black Label Variety comprises one percent of the Augustine ceramic group and .18 percent of the sherds in this study.

Ware: Vitzil Orange-Red ware

Established: Rice (1985:13-14) first described the type from Tipuj pottery collections.

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction

(0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Black slipped incised area; 2) Fine line, post-fire incising; 3) Red exterior slip surrounding incised area; 4) Red carbonate paste.

Paste and firing: The red (2.5YR 4/8) paste is completely oxidized and was estimated to have been fired between 650-700°C with a Mohs' hardness of 2. The clay matrix is dominated by cryptocrystalline calcite with quartz, biotite, and hematite inclusions.

Surface treatment and decoration: The exterior surface is slipped reddish-brown (2.5YR 5/4) and the incised area is slipped black (7.5YR 2.5/1). The red slip is very eroded while the black slip is better preserved. Both slips may have had a low luster, but only the black slip retains its low luster.

The post-fire incised decoration is marked by a single lower circumferential band. The decorative motif is most probably a bird; however only plumes exist on the fragmented sherd.

Form and dimension: The above description is based on a body sherd of indeterminate form with a wall thickness of 8.28 mm.

Illustration: Figure 35

Intrasite references: The sherd was located in level 1 (collapse) of the Postclassic plaza floor of Complex I at Tipuj.

Intersite references: Johnny Walker Red: Black Label Variety does not exist at other Petén lakes sites. However, Rice (1985:13) notes that similar vessels have been reported at Lamanai and in northern Yucatecan traditions in the Terminal Postclassic to Historic period deposits. She also notes that this type is an example of the "general

Figure 35: Johnny Walker Red Rim Profile from Tipuj.

decline in the attention given to finishing, slipping, and firing" during the later periods of occupation at most Maya sites (Rice 1985:13).

Topoxté Ceramic Group

Name: Topoxté Red: Topoxté Variety

Frequency: This description is based on 55 sherds: 17 from Ixlú and 38 from Tipuj. Topoxté Red: Topoxté Variety constitutes 45 percent of the Topoxté ceramic group and10 percent of the total sherds in this study.

Ware: Clemencia Cream Paste ware.

Established: Bullard (1970) first described Topoxté Red pottery from collections of pottery excavated at Topoxté Island. Rice (1979:15-21) modified this type and variety CPHEP excavations on Canté Island.

Types of analysis: "Low-tech" (55 sherds); petrographic (24 sherds); x-ray diffraction (1 sherd); EDS and SEM and strong-acid extraction ICPS (9 sherds).

Principal identifying modes: 1) Red to yellowish red slip; 2) Cream to light gray to pale brown marly paste; 3) Tripod plates, narrow neck jars, collared jars, and restricted orifice bowls.

Paste and firing: Topoxté Red: Topoxté Variety pastes have two different paste colors: pale brown (10YR 8/2, 8/3, 7/3, 7/4) and light gray (10YR 7/1, 2.5Y 7/1). Although the majority of the sherds are oxidized throughout, three sherds have gray to light gray cores. Estimated firing temperatures vary from 400-650°C with a core hardness of 2-3 on the Mohs' hardness scale.

The fine marly textured paste has fine inclusions of euhedral, subhedral, and cryptocrystalline calcite, quartz, hematite, biotite, and chert minerals. Different inclusions combine together to form three different clay matrix groups: 1) voids and few (<1 percent) inclusions; 2) calcite, quartz, hematite, and biotite; and 3) calcite, quartz, hematite, biotite, and chert.

Surface treatment and decoration: Interior and/or exterior surfaces are slipped red (10R 5/6, 4/6, 2.5YR 5/8, 4/8) to yellowish red (5YR 5/6). Black fireclouds occur on the exterior of many of the sherds. Slips are .25-.575 mm thick and oxidized layers exist directly below the slip. Most slips have a matte finish; however some exhibit a low luster finish that may be the result of double slipping (red and creamy white) or deposition. Slip hardness is 2-3.

Forms and dimensions: The present sample of Topoxté Red: Topoxté Variety includes narrow neck jars (n=9), tripod plates (n=2), collared jars (n=5), and restricted orifice jars (n=1). Narrow neck jar rim diameters range from 6-32 cm ($\bar{x}$=20.67 cm) with wall thicknesses of 4.96-8.53 mm ($\bar{x}$=5.44 mm). Narrow neck jar heights range from 8.5-6.0 cm (most sherds are too fragmentary to measure neck height) with outcurving walls. Direct rims are exteriorly thickened with round lip shapes.

Tripod plate rim diameters vary from 20-24 cm ($\bar{x}$=22 cm) and wall thicknesses range from 5.28-5.32 mm ($\bar{x}$= 5.30 mm). The slightly flared walls have direct rims with rounded and interiorly beveled lip shapes. Although not included in the study, tripod supports are cylinder, scroll, and bulbous forms.

Collared jar rim diameters range from 14-40 cm ($\bar{x}$=29.2 cm) and wall thicknesses range from 5.28-8.2 mm ($\bar{x}$=7.25 mm). The direct rims of the outflared necks have rounded, squared, and interiorly beveled lip shapes.

One restricted orifice bowl has a rim diameter of 22 cm and a wall thickness of 6.51 mm. The direct rim is rounded.

Illustrations: Figures 36, 37, and 38

Intrasite references: All sherds in this description come from the first three levels of excavation (humus, collapse, floor). Four structures from Ixlú had Topoxté Red: Topoxté Variety sherds: 2022 (open hall), 2023 (temple), 2034 (temple), 2041 (residence). Structure 2041 had the highest number of Topoxté Red sherds. Topoxté Red: Topoxté Variety sherds from Tipuj were located in Complex 1 at the following structures: 1 (oratory), 2 (temple), 3 (open hall), and 4 (colonnaded hall).

In addition to the sherds used in the above description, all of the structures at Zacpetén had varying amounts of Topoxté Red: Topoxté Variety sherds.

Intersite references: Topoxté Red sherds also occur at Tayasal, Macanché Island, and Topoxté Island. Zacpetén, Macanché Island, and Topoxté Island have the highest concentrations of Topoxté Red pottery in the Petén lakes area. All sites with Topoxté Red: Topoxté Variety sherds have a variety of paste colors and qualities. However, my observations of Zacpetén and Topoxté Island Topoxté Red pottery suggest that the two sites have the highest frequency of well-oxidized creamy "white" sherds. While Tayasal and Macanché Island have some of the "white" paste sherds, the majority of the pastes have a yellowish tint or darker cores (personal observation). Most of the sherds from Macanché Island have a creamy white overcoat on the exterior slipped surfaces. This may be a case of double slipping, or it may be a result of deposition because the same phenomenon does not appear at other sites. In addition to sherds sherds from Macanché

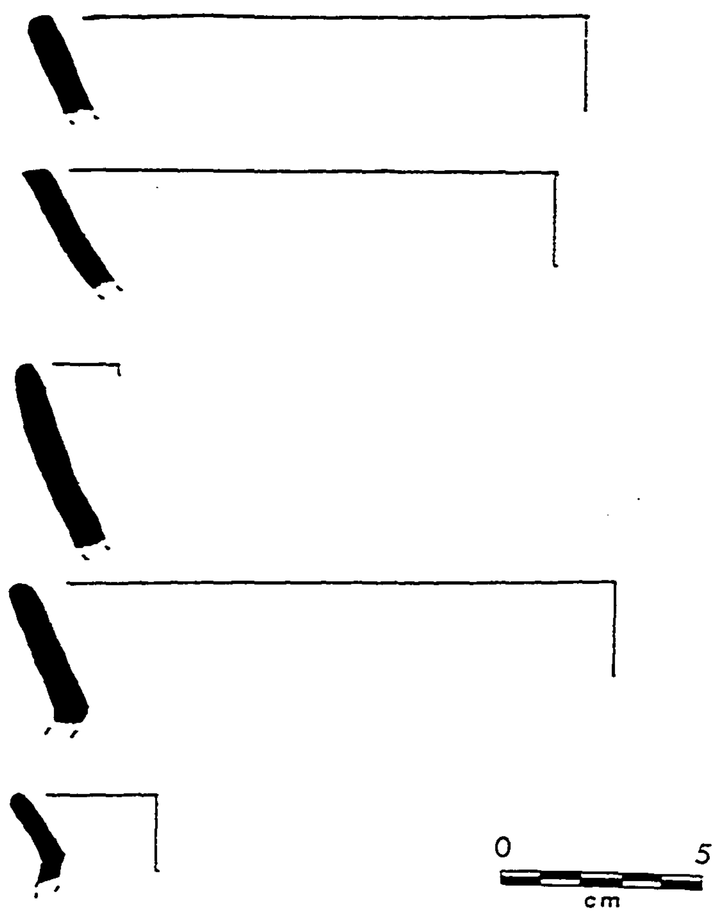


Figure 36: Topoxté Red Tripod Plate Rim Profiles from Tipuj.

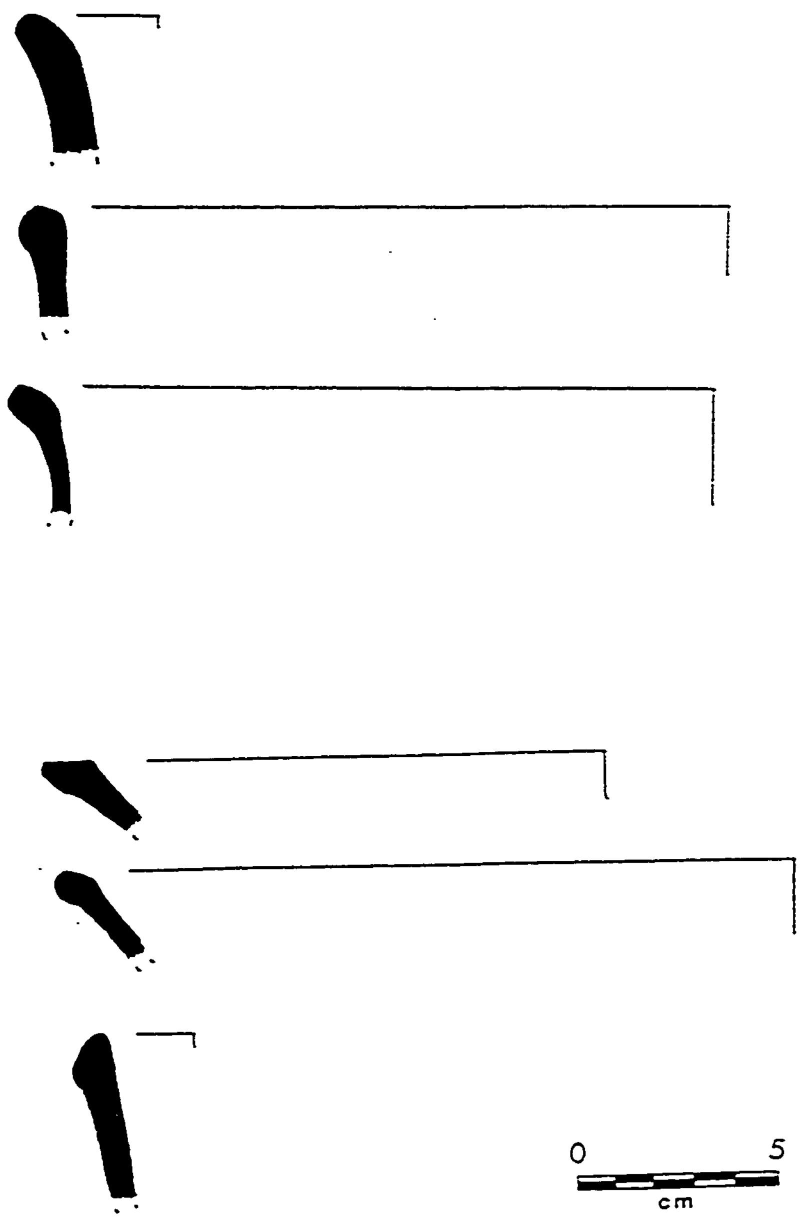


Figure 37: Topoxté Red Jar Rim Profiles from Tipuj.

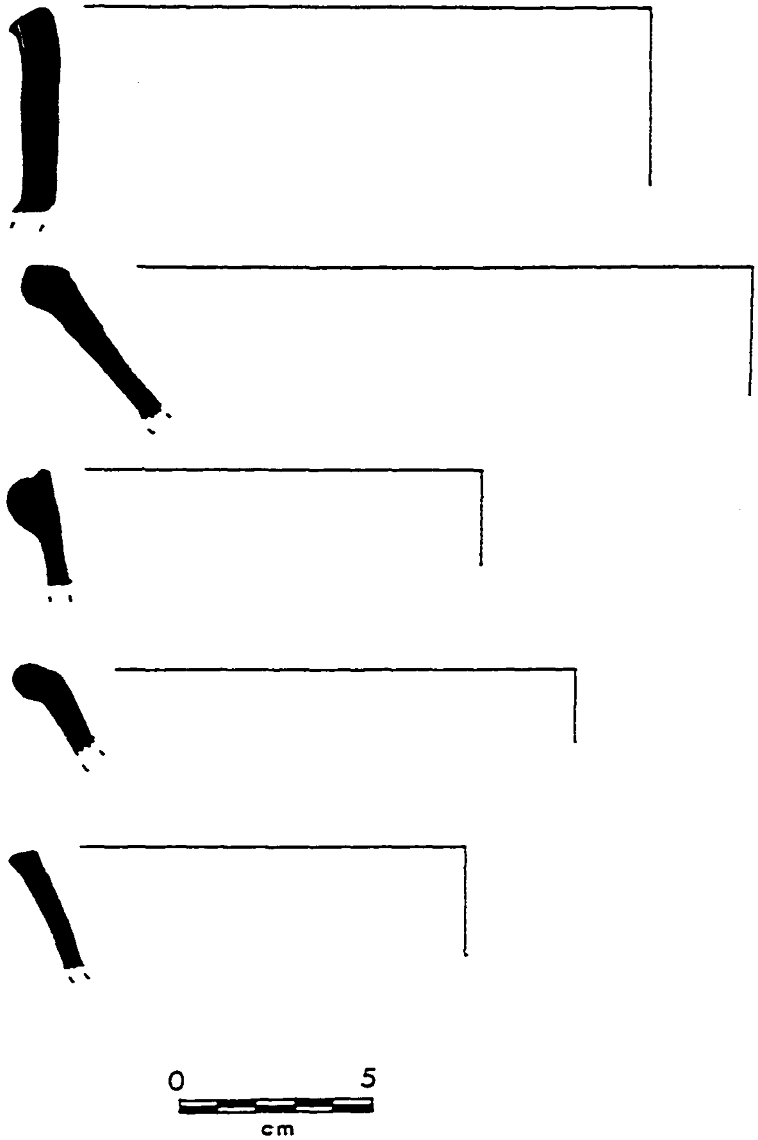


Figure 38: Topoxté Red Miscellaneous Rim Profiles from Tipuj.

Island, three Topoxté Red: Topoxté Variety sherds were reported at Tayasal; however, no description is given (Chase 1983).

Red monochrome slipped vessels have a widespread distribution in the Maya lowlands that begins in the Preclassic period and continues through the Historic period. In addition to the Petén Lakes region, red slipped vessels occur in Yucatán (Chichen Red, Tulum Red, and Mayapán Red).

Name: Pastel Polychrome: Pastel Variety

Frequency: Eight sherds comprise this description: seven from Zacpetén and one from Tipuj. Pastel Polychrome: Pastel Variety represents seven percent of the sherds from the Topoxté ceramic group and 1.5 percent of the total sherds in this sample.

Ware: Clemencia Cream Paste ware.

Established: Rice (1979:21-28) first defined Pastel Polychrome: Pastel Variety based on the ceramic collection from Canté Island excavated by the CPHEP in 1974.

Types of analysis: "Low-tech" (8 sherds); petrographic (4 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (2 sherds).

Principal identifying modes: 1) Black painted decoration on the interior of tripod dishes and exterior of restricted orifice bowls; 2) Red to reddish yellow to yellowish red slip; 3) Pale brown to white marly paste; 4) Tripod dishes and restricted orifice bowls.

Paste and firing: Paste colors range from white (2.5YR 8/1) to very pale brown (10YR 8/2, 8/3, 7/3). All of the sherds are completely oxidized and estimated firing temperatures range from 300-700°C with core hardness of 3 on the Mohs' hardness scale.

The fine textured marly paste is dominated by cryptocrystalline calcite, but also contains euhedral and subhedral calcite, quartz, hematite, biotite, and chert.

Surface treatment and decoration: Tripod dish exteriors are slipped red (2.5YR 6/8, 5/8, 5YR 6/6, 6/8, 5/8). Restricted orifice bowls are slipped the same color below the black painted decorations and on the lip. Slips have a matte texture and are .25-.75 mm thick. Slip hardness ranges from 2-3 on the Mohs' hardness scale.

Interior surfaces of tripod dishes and exterior surfaces of restricted orifice bowls are painted with black (7.5YR 2.5/1) or very dark gray (10YR 3/1, 2.5Y 3/1) bands and decorative motifs. The bands and decorations are painted on a white (5Y 8/1) primary slip. Tripod plates have one or two circumferential bands near the rim and one circumferential band at the wall/base junction. The bands delineate decorative motifs. While most of decorative elements are eroded, two elements remain: hooks and parentheses.

Forms and dimensions: Tripod dishes (n=5) and restricted orifice bowls (n=2) comprise the two forms included in the sample of Pastel Polychrome: Pastel Variety. Tripod dishes have slightly flared walls, direct rims, and round, square, and interiorly beveled lip shapes. Rim diameters range from 20-28 cm ($\bar{x}$=24.8 cm) and wall thickness ranges from 5.2-6.49 mm ($\bar{x}$=5.50 mm).

Restricted orifice bowls have curved walls, direct rims, and rounded and interiorly beveled lip shapes. The bowl rim diameters range from 20-28 cm ($\bar{x}$=24 cm) and wall thicknesses vary from 5.07-6.33 mm ($\bar{x}$=5.71).

Illustrations: Figure 39

Intrasite references: Pastel Polychrome: Pastel Variety sherds were excavated at Zacpetén and Tipuj. At Zacpetén, the sherds were located in Structure 719 (a residence)

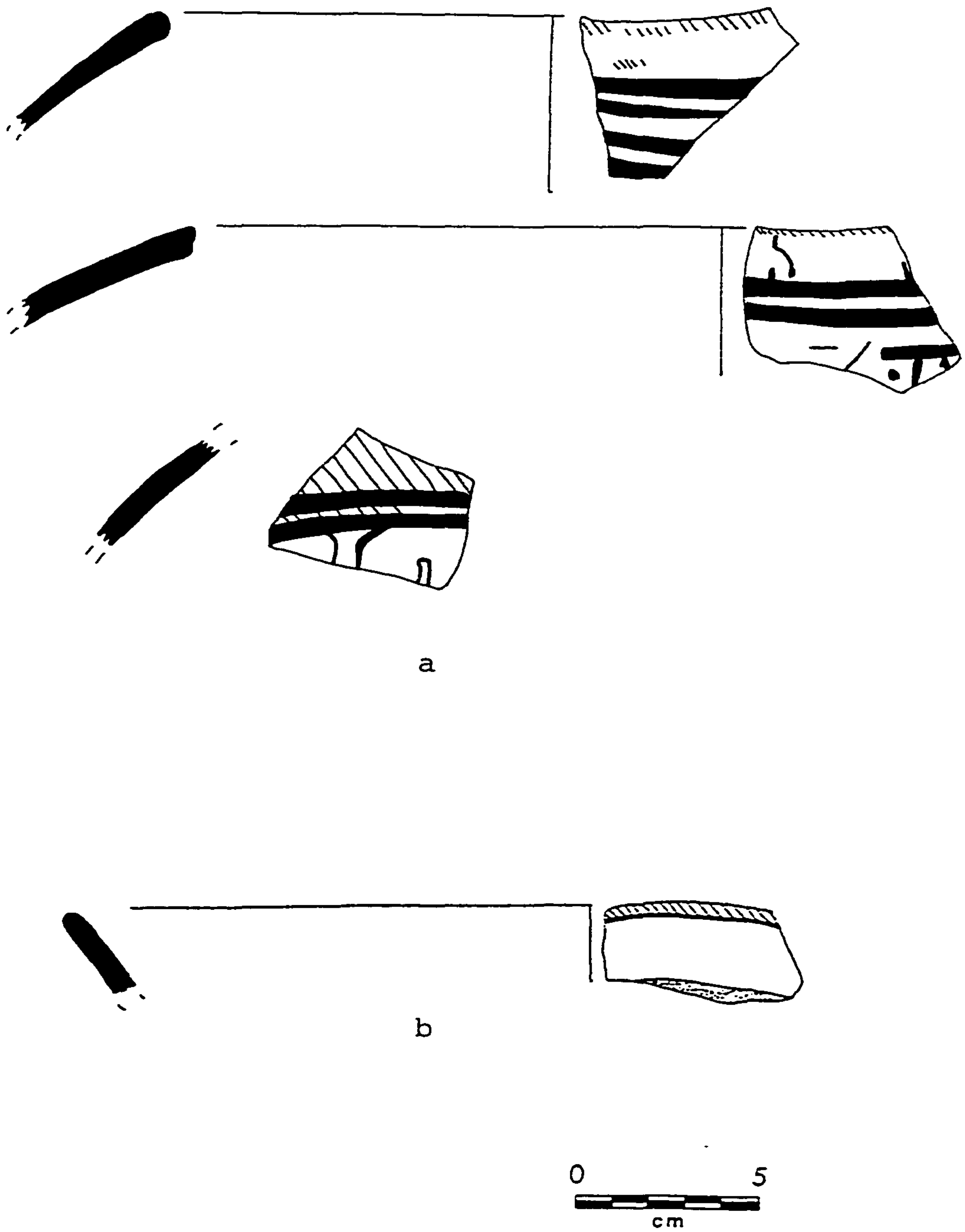


Figure 39: Pastel Polychrome Rim Profiles from Zacpetén (a) and Tipuj (b).

at levels 2 (collapse), 3 (floor), and 5 (construction fill), in Structure 765 (a raised shrine) at level 2 (collapse), and in Structure 767 (an open hall) at level 3 (floor). The sherd from Tipuj was located in Structure 1 (oratorio) at level 1 (humus).

Additional Pastel Polychrome sherds not included in the present study were located in the first three levels of Structure 758 (residence), Structure 764 (temple), and Structure 766 (statue shrine).

Intersite references: Pastel Polychrome's black line decoration has parallels to Pek Polychrome, Ixpop Polychrome, and Mul Polychrome. Decoration areas in all of the types are delineated by black circumferential bands, have a thin primary slip, and a similar decorative element complex. Common decorative elements include hooks, curls, and parentheses. For a comprehensive comparison of the types and decorative elements see Rice (1979:24-28).

I observed Pastel Polychrome sherds from Macanché Island and Topoxté Island. The two sherds from Macanché Island are similar to those excavated at Zacpetén. One sherd represents a tripod dish and the other a restricted orifice bowl. Further discussion is not possible due to poor preservation and the fragmentary nature of the sherds.

Topoxté Island excavations by Guatemalan archaeologists in 1998 and by Bullard in the 1960s provide more examples of Pastel Polychrome sherds. Again, tripod dishes and restricted orifice bowls dominate the form categories. A light red (2.5YR 6/8) primary slip appears on most of the tripod dish fragments. Decorative motifs are similar to those discussed above and those on Pek Polychrome, Ixpop Polychrome, and Mul Polychrome types. Tripod dishes from Bullard's collection have notably smaller rim diameters (19-21 cm) than those at Zacpetén and Tipuj.

Sherds from the 1998 excavations at Topoxté Island produced sherds with hook, mat, and small line dash decorative motifs. The majority of these sherds have gray cores and do not have the same clear "white" colored paste as those at Zacpetén, Tipuj, and earlier excavations at Topoxté Island.

Pastel Polychrome has not been located outside the Petén lakes region, but there are some affinities in northern Yucatán. Black painted decoration that resembles Pastel Polychrome occurs in northern Yucatán as Mama Red: Black-on-unslipped Variety Polychrome (Mayapán Red ware) (Smith 1971:22-23).

Name: Canté Polychrome: Canté Variety

Frequency: The following description of Canté Polychrome: Canté Variety is based on four sherds: three from Zacpetén and one from Tipuj. This sample constitutes three percent of the Topoxté ceramic group and .73 percent of the total sample in this study.

Ware: Clemencia Cream Paste ware.

Established: Rice (1979:42-45) first described Canté Polychrome: Canté Variety based on pottery from Bullards' excavations at Topoxté Island.

Types of analysis: "Low-tech" (4 sherds); petrographic (4 sherds); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Red and black painted decoration; 2) Red to yellowish red slip; 3) Very pale brown marly paste; 4) Tripod dishes and collared jars.

Paste and firing: Pastes are very pale brown (10YR 7/2, 7/3, 7,4) and are completely oxidized. Estimated firing temperature range between 300-600°C. The oxidized sherds have a Mohs' hardness of 2-3.

The light colored fine marly pastes resemble those of Pastel Polychrome. The paste is dominated by cryptocrystalline calcite but also contains euhedral and subhedral calcite, quartz, hematite, biotite, and chert.

Surface treatment and decoration: Exterior surfaces are slipped red (2.5YR 5/8, 10R 4/4) to light red (2.5YR 6/8) to yellowish red (5YR 6/6) and have a matte finish. The slips are .25-.75 mm thick with a Mohs' hardness of 2-3. While no fire clouding occurs, one sherd has small black spots throughout the slipped surface.

Interior surfaces of tripod dishes and collared jars are decorated by red and black paint on a thin pale brown (10YR 8/3, 7/3) to pale yellow (2.5Y 7/3) primary slip. The decorative panel is delineated by red (17.5R 4/4, 10YR 4/6) and black (10YR 3/1, 2/1) alternating circumferential bands in the following patterns: red, black, and red; red, red and black; or red and black. Bands defining the bottom of the decoration area are not present due to the fragmentary nature of the sherds. Decoration panels are eroded; however, one decoration consists of a black curvilinear decoration with red dots.

One tripod base sherd from Tipuj is decorated with a series of red rounded bands and circles with a black curvilinear line that connects two black open circles.

Forms and dimensions: Canté Polychrome: Canté Variety sherds represent tripod dish (n=3) and collared bowl (n=1) forms. Tripod dishes have slightly flared or rounded walls with rounded and interiorly beveled lip shapes. One sherd has a measurable rim diameter of 30 cm and a wall thickness of 6.55 mm.

The collared jar sherd has a rim diameter of 20 cm with a wall thickness of 6.38. The neck is outflaring with a direct rim and a rounded lip shape.

Illustrations: Figure 40

Intrasite references: The three sherds from Zacpetén were located in Structures 719 (a residence) at levels 3a and 3b, and 767 (an open hall) at level 2 (collapse). The sherd from Tipuj was located in level 2 (collapse) of Structure 1 (an oratory).

In addition to the sherds described above, Canté Polychrome sherds were also located in structures 605 (oratorio) and 767 (open hall) at Zacpetén.

Intrasite references: Canté Polychrome's red and black painted decoration techniques resemble those of Graciela Polychrome, Sacá Polychrome, and Dolorido Polychrome types. All of the types have a series of red and black circumferential bands with red and/or black decorative motifs. Although decorative elements are eroded, similarities exist in curvilinear lines, mat motifs, and circles.

Canté Polychrome sherds also occur at Topoxté Island in the Petén Lakes region. From Bullard's collection from the 1960s, I examined Canté Polychrome sherds that represented tripod dishes, restricted orifice jars, and collared bowls. The decoration area is delineated by circumferential red and black bands and has a "thin orange slip over the cream paste background" (Rice 1979:43). Decorative elements include those described above, as well as hooks, mat motifs, and stepped frets. Some stepped frets are outlined in black and colored with red paint. The stepped frets also occur in Chompoxté Red-on-cream: Kayukos Variety and Macanché Red-on-paste: Tachís Variety types.

Excavations by Guatemalan archaeologists in 1998 at Topoxté Island also produced Canté Polychrome sherds. I observed that decorative motifs include filled black chevrons outlined in red, large circles surrounded by smaller dots, pyramids, mat motifs,

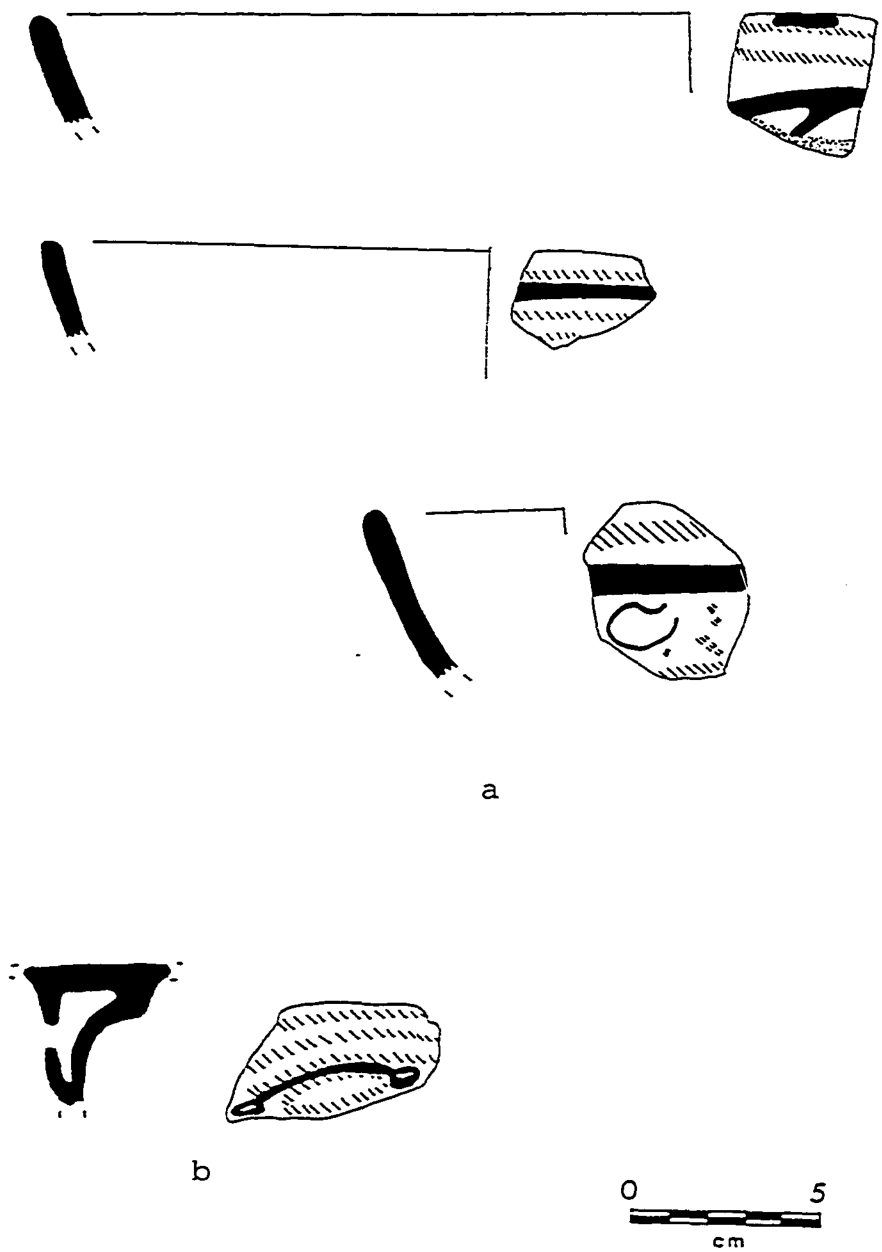


Figure 40: Canté Polychrome Rim Profiles from Zacpetén (a) and Tipuj (b).

and alternating red and black "Serpent Y Complexes" motif as seen in at Uaxactún (Smith 1955:70-71). One jar had alternating black or red painted decorative panels. The red decoration color on the majority of sherds is dusky red (10R 3/3). Pastes have a tendency to be slightly pink (5YR 8/2) and well fired.

Red and black decoration on Postclassic pottery is rare in the Maya lowlands. Pele Polychrome jars of San Joaquin Buff ware at Mayapán may be similar (Smith 1971:229).

Name: Chompoxté Red-on-cream: Kayukos Variety

Frequency: This description is based on one sherd from Zacpetén. This sherd constitutes one percent of the Topoxté ceramic group and .18 percent of the total sherds in the study.

Ware: Clemencia Cream Paste ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (1 sherds); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Angular and geometric red banded decorations; 2) Yellowish red primary slip; 3) Gray marly paste; 4) Jars.

Paste and firing: The incompletely oxidized sherd has a gray (10YR 6/1) core with light yellowish brown (10YR 6/4) margins. The estimated firing temperature was 650˚C with a core hardness of 3.

The marly paste is dominated by cryptocrystalline calcite. Euhedral and subhedral calcite, hematite, quartz, chert, and biotite also occur in the clay matrix.

Surface treatment and decoration: The exterior surface of the jar neck and shoulder is unslipped; however a yellowish red primary slip (5YR 6/6) occurs under the decoration. The red (2.5YR 4/4) decoration is more brown than most Chompoxté Red-on-paste decorations. Three circumferential bands delineate the bottom of the decorative area. Above the bands is an angular geometric decoration that appears to be a stepped pyramid with nested chevrons in the interior of the pyramid. A circle surrounded by small red dots appears to the left of the pyramid/triangle motif.

Forms and dimensions: The sherd is a combination of a jar neck and shoulder. No rim diameters were measurable, but the wall thickness is 6.59 mm. Based on the neck fragment, this may be a narrow neck jar with a relatively high neck (approximately 6-8 cm in height).

Illustration: Figure 41

Intrasite references: This sherd was located at Zacpetén in level 3a of Structure 732 (a residence). Other sherds of this type were also located at Zacpetén.

Intersite references: Chompoxté Red-on-paste: Kayukos Variety's angular and geometric decoration style resembles those of Macanché Red-on-paste: Tachís Variety and the Tachís ceramic group described by Cowgill (1963:112-115). Similar triangle and pyramid decorations occur in both types.

At Topoxté Island, Rice (1979:33-34) noted that tripod dishes and jars subsumed under the Chompoxté Red-on-cream: Chompoxté Variety description have chevrons, geometric shapes, and nested rectangles. I examined Kayukos Variety sherds from recent

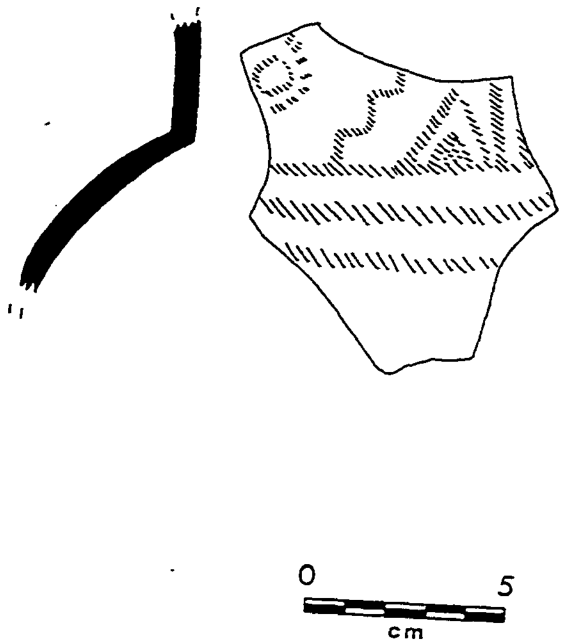


Figure 41: Chompoxté Red-on-paste: Kuyakos Variety Rim Profile from Zacpetén.

excavations (1998) at Topoxté Island with chevrons, pyramids, and stepped frets. Some of these sherds have Maya blue on the surfaces.

Outside of the Petén lakes regions affinities can be seen in decorative elements from Mayapán (Smith 1971:48-67). Chevrons, pyramids, stepped frets and embedded triangles appear on most Postclassic pottery in northern Yucatán.

Name: Chompoxté Red-on-cream: Chompoxté Variety

Frequency: The following description is based on four sherds: three from Zacpetén and one from Tipuj. This sample represents three percent of the Topoxté ceramic group and .73 percent of the total sample in this study.

Ware: Clemencia Cream Paste ware.

Established: Rice (1979:31-42) first defined Chompoxté Red-on-cream: Chompoxté Variety from pottery collections of Topoxté Island.

Types of analysis: "Low-tech" (4 sherds); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (2 sherds).

Principal identifying modes: 1) Non-banded dark red complex decorations; 2) Red exterior slip; 3) Light brownish gray to very pale brown marly paste; 4) Tripod dishes.

Paste and firing: Chompoxté Red-on-cream: Chompoxté Variety pastes are pale brown (10YR 8/2, 8/3) to very pale brown (10YR 6/2). Unlike most Topoxté group ceramics, darker cores appear in one-half of the sherds and estimated firing temperatures are also lower--300-500°C. Core hardness is 3 on the Mohs' hardness scale.

Cryptocrystalline calcite dominates the clay matrix. Euhedral and subhedral calcite, hematite, quartz, and chert also occur in the clay matrix.

Surface finish and decoration: Exterior surfaces and interior rim surfaces of the tripod dishes are slipped red (10R 5/8, 4/6, 7.5R 3/6). Red slips have a matte finish and black fireclouds occur on vessels walls and near rims. The slip is .5 mm thick and has a Mohs' hardness of 2-3.

Interior walls and some bases are decorated with dark red (7.5R 3/6) to red (10R 4/4, 4/6) paint. Decoration elements are not banded, but are often a result of negative painting (the background is painted red rather than an element outline). Interior colors have a low luster and a hardness of 2-3. Decorations are painted over a light gray (10YR 7/2) to very pale brown (10YR 8/3) primary slip. Decorative elements include circles, birds, mats, and possible aquatic creatures. One tripod dish wall has decorative elements on interior (eroded) and exterior (mat motif) surfaces.

Forms and dimensions: Although there are four sherds that represent tripod dishes in the study, only one provides a rim diameter. The tripod dish has slightly rounded walls, no basal angle, and a direct rim with a rounded lip shape. The rim diameter is 28 cm. Wall thicknesses of all four sherds range from 5.98-8.17 mm ($\bar{x}$=7.10 mm).

Illustrations: Figure 42

Intrasite references: Sherds from Zacpetén came from levels 1 (humus) and 3a (below the latest floor) of Structure 719 (a residence) and level 2 of Structure 732 (a residence). The sherd from Tipuj came from level 1 (0-101.5 cm) of Structure 2 (a temple).

Chompoxté Red-on-cream: Chompoxté Variety sherds not included in the study

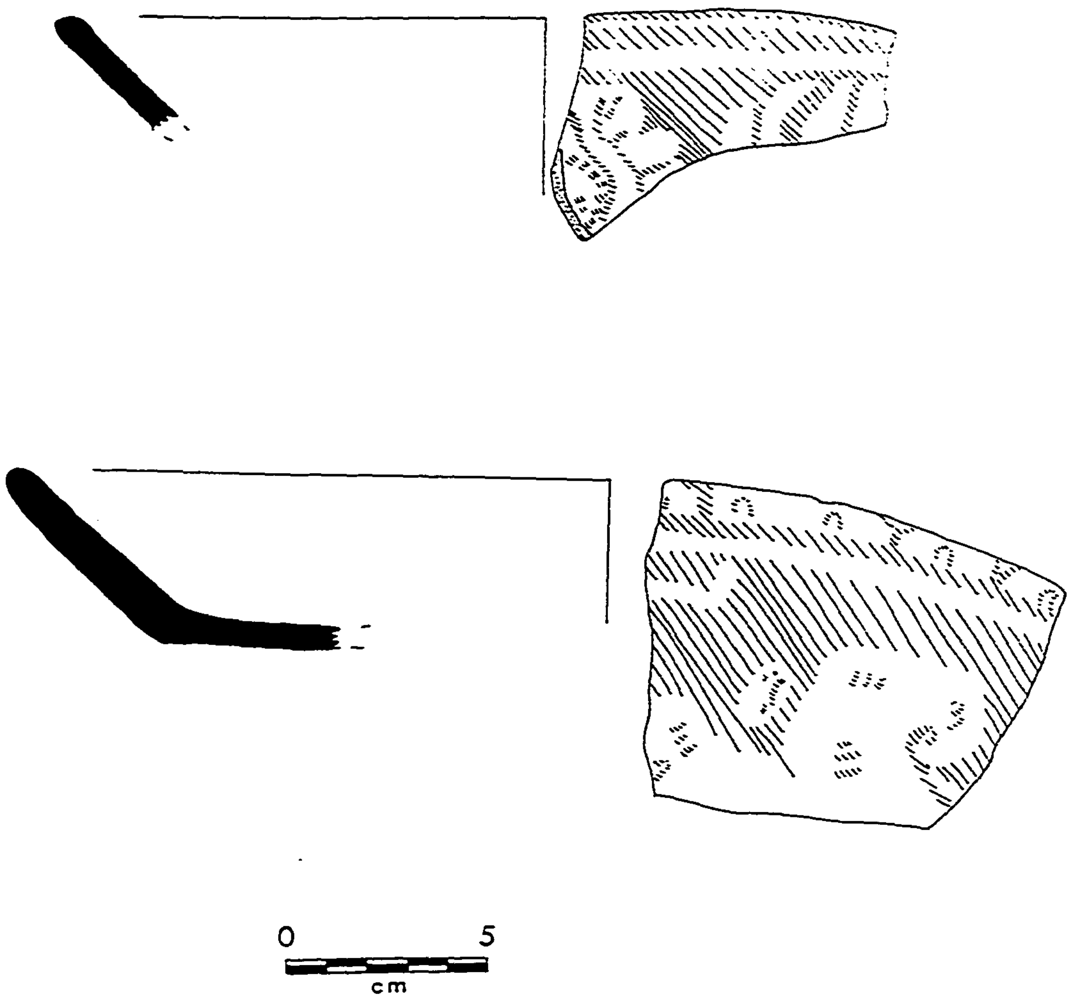


Figure 42: Chompoxté Red-on-paste: Chompoxté Variety Rim Profiles from Zacpetén.

were also located in Structure 603 (oratorio) and Structure 615 (open hall) at Zacpetén.

Intersite references: The non-banded red decoration of Chompoxté Red-on-cream: Chompoxté Variety resembles other non-banded red decorated types (Macanché Red-on-paste and Picté Red-on-paste: Ivo Variety) in the Petén Lakes region. Unfortunately, the decorative elements of the Postclassic types are too eroded to allow for decoration analogies.

I examined Chompoxté Red-on-cream: Chompoxté Variety sherds from Macanché Island and Topoxté Island. Sherds from Macanché Island represent tripod dishes similar to those described above as well as collared bowls, neckless jars, and miscellaneous jars. Although paste and slip colors are similar to those previously described, exterior surfaces appear to have a creamy overcoat which may be a result of deposition rather than an actual double slip.

Topoxté Island Chompoxté Red-on-cream: Chompoxté Variety sherds from the 1998 excavations and from Bullard's collection are well preserved. The decorations are complex with combinations of curls, hooks, mat motifs, and an underwater motif (combination of a mat motif and a hook) (Helmuth1987:156). The decoration colors are darker red (7.5R 3/4) than the exterior slip, have a low luster, and are painted over a cream colored primary slip. Execution of decorative elements on sherds from Topoxté Island appears to be more carefully produced. Paste colors are highly variable from light gray to pink to white/buff.

Other red-on-cream/paste/buff painting traditions exist throughout the Maya lowlands. Although the examples are not great in quantity, Mayapán's Tecoh Red-on-buff (Smith 1971:29) and Naco's Nolasco Bichrome types (Wonderley 1981) resemble those in the Petén lakes region.

Name: Chompoxté Red-on-cream; Akalché Variety

Frequency: Fifty sherds (41 from Zapetén and 9 from Tipuj) represent the sample for the following description. The sample constitutes 41 percent of the Topoxté ceramic group and 9.09 percent of the sherds in this sample.

Ware: Clemencia Cream Paste ware.

Established: Based on a pottery collection from Canté Island, Rice (1979:28-31) first described the Akalché variety.

Types of analysis: "Low-tech" (50 sherds); petrographic (22 sherds); x-ray diffraction (3 sherds); EDS and SEM and strong-acid extraction ICPS (9 sherds).

Principal identifying modes: 1) Banded dark red painted decoration; 2) Exterior light red to dark red slip; 3) Very pale brown marly paste; 4) Tripod dishes, collared jars, flanged collared jars, and narrow neck jars.

Paste and firing: All but three of the fine marly pastes are completely oxidized resulting in a very pale brown (10YR 8/3, 7/3, 7/4) color. Estimated giring temperatures range from 300-650°C; however, it is estimated that the majority of the sherds were fired from 300-500°C. Core hardness is 3 based on the Mohs' hardness scale.

Although the paste of Chompoxté Red-on-cream: Alkaché Variety resembles those of other Topoxté ceramic group pastes, three distinct groups of inclusions occur in this type. The first group consists of euhedral and subhedral calcite, hematite, quartz, plus biotite. The second group consists of euhedral and subhedral calcite, hematite, quartz, plus chalcedony. The final group consists of euhedral and subhedral calcite, hematite, quartz, plus chalcedony and biotite.

Surface treatment and decoration: Exterior surfaces of tripod dishes and collared bowls are slipped light red (2.5YR 6/8), red (2.5YR 5/8, 4/8, 10R 5/6, 5/8, 4/6), and dark red (2.5YR 3/6). Slipped surfaces have a matte finish and black fireclouds are common.

Exterior surfaces of narrow neck jars and interior surfaces of tripod dishes and collared bowls are decorated with a darker red (10R 5/8-3/4, 7.5R 4/8-4/4, 2.5YR 5/8-4/4) pigment than the red slip. Decorations are painted over a very light brown (10YR 8/3, 7/3) primary slip and are delineated by circumferential bands. Vertical lines create decoration panels on some vessels.

The series of bands closest to the rim appear as single or double circumferential bands. A single band defines the bottom of the decorative area that is he near the base. Most tripod dish and collared bowl decorative motifs are eroded; however, hooks, parentheses, circles, plumes, and dots occasionally occur. There is one flanged collared jar with a series of three circumferential bands above the flange and red slip below the bands. The flanges are painted with vertical red stripes.

Narrow neck jar decorations are on the exterior of the vessel. Sherds from Zacpetén typically have two areas of decoration: one on the neck and one on the shoulder. The two areas are separated by two or three circumferential bands. Jar shoulder decoration areas are paneled. Decorative motifs include glyphic representations of the *Ajaw* glyph, mat motifs, and curvilinear lines. These decorations appear in positive and negative painting styles. One sherd has chevrons along the rim followed by three circumferential bands and vertical lines beneath the three bands.

The narrow neck jar from Tipuj is slipped a solid color 4 cm from the lip. Below the solid slip at the neck/shoulder junction, two circumferential bands appear. The area below the bands is eroded.

Forms and dimensions: Tripod dishes (n=30), collared jars (n=1), flanged, collared jars (n=1) , and narrow neck jars (n=3) have banded red decorations. Tripod dishes have slightly flared walls and direct rims with square, round, and interiorly beveled lip shapes. Rim diameters range from 18-28 cm ($\bar{x}$=24.76 cm) and wall diameters range from 4.65-7.85 mm ($\bar{x}$=5.84 mm).

The one collared jar fragment has an outflaring neck with a direct rim and a square lip shape. The rim diameter is 26 cm and the wall thickness measures 6.39 mm.

The flanged collared jar fragment has flanges that are 7.89 mm tall. The wall thickness is 4.94 mm. Because this sherd is a body fragment, no other measurements are possible.

Narrow neck jars have short (4 cm) straight and slightly curved tall (8-9 cm) necks. The direct rim on the short neck jar has a rounded lip shape, a rim diameter of 8 cm and a wall thickness of 6.35 mm. The remaining 3 tall rim sherds have everted, exteriorly thickened lip shapes. Rim diameters are 18 cm, 18 cm, and 20 cm and wall thickness are 7.76 mm, 7.88 mm, and 7.38 mm, respectively.

Illustrations: Figure 43

Intrasite references: The 41 sherds from Zacpetén were located in levels 1, 2, and 3 in a variety of locations: Strs. 601 (raised shrine), 606 (open hall), 664 (residence), 719 (residence), 721 (temple), 748 (unknown), 758 (residence), 764 (temple), 765 (raised shrine), and 767 (open hall). The nine sherds from Tipuj were found in the first four levels of Structures 2 (temple) and 3 (open hall).

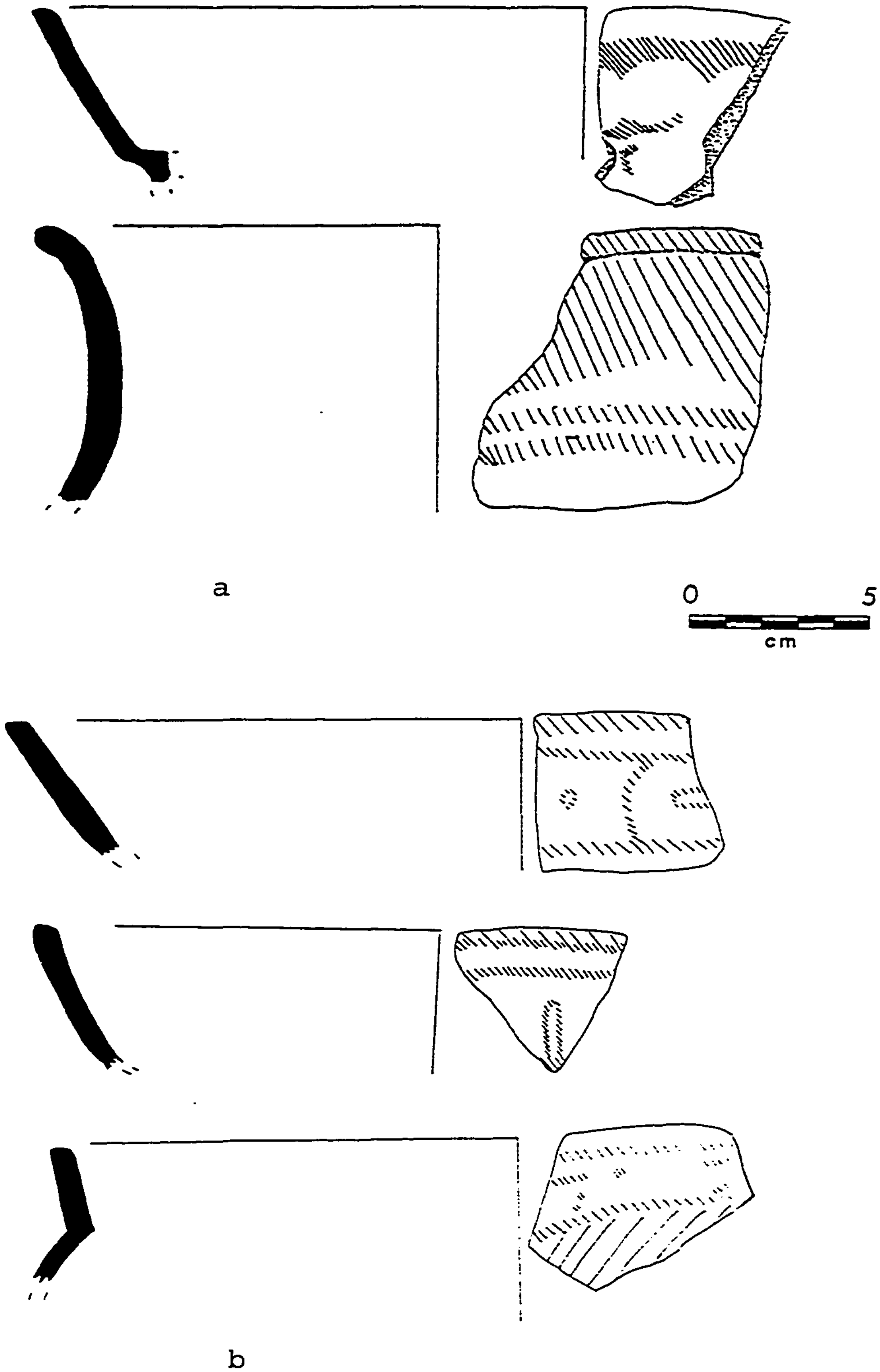


Figure 43: Chompoxté Red-on-paste: Akalché Variety Rim Profiles from Tipuj (a) and Zacpetén (b).

Chompoxté Red-on-cream: Akalché Variety sherds were also located in all structures at Zacpetén except Structure 607 (statue shrine). Tipuj's Structure 1 (oratorio) also had a Chompoxté Red-on-cream: Akalché Variety sherd.

Intersite reference: The decoration and forms of Chompoxté Red-on-cream: Akalché Variety do not vary in the Petén lakes region. Forms and decorative elements mimic those on Ixpop Polychrome: Ixpop Variety, Macanché Red-on-paste: Macanché Variety and Sotano Red-on-paste: Sotano Variety sherds. Black line banded polychrome types are a variant of the red line decoration described above.

I examined Chompoxté Red-on-cream: Akalché Variety pottery from Tayasal, Macanché Island, and Topoxté Island. One Akalché Variety sherd was located by Chase (1983) at Tayasal. This sherd has a very pale brown (10YR 7/4) paste and is similar to sherds at other sites in the Petén lakes region. The Tayasal tripod dish's red decoration is darker than the exterior slip, the decorative area may have a creamy primary slip, and there are two top and one bottom circumferential bands to delineate the decorative motifs that are eroded. The rim diameter is 28 cm.

Sherds from Macanché Island are eroded, but their dark red decoration and a lighter slip color is similar to the sherds from Zacpetén. All of the tripod dishes with some painted decoration have a double circumferential band near the rim and a single circumferential band near the base. Bands are painted over a creamy primary slip. One bowl has a four-step basal flange that is stepped to the right. The tripod dish with a measurable rim diameter is 24 cm.

Chompoxté Red-on-cream: Akalché Variety sherds from Bullard's excavations at Topoxté Island yielded tripod dishes, restricted orifice bowls, high neck jars, and flanged collared jars. Similar to the sites discussed above, decoration areas are delineated by circumferential bands and have a creamy primary slip. The pastes tend to vary in color from white to light gray and sherds with lighter colors have a higher hardness reading and are most likely fired at a higher temperature. Decorative motifs include hooks, plumes, parentheses, and dots.

One collared bowl and one tripod dish are coated with Maya Blue pigment on the interior surfaces. The blue pigment is over the red decoration suggesting that the vessels may have held the pigment.

Guatemalan excavations at Topoxté Island in 1998 also revealed Chompoxté Red-on-cream: Akalché Variety sherds that were better preserved than most of those described above. Pastes range from white to pale yellow (2.5Y 8/2) to gray. Again, most of the decoration areas are delineated by two top and one bottom circumferential bands and painted on a creamy to light red (2.5YR 6/8) primary slip. Decorative elements are similar to those described for Zacpetén and Macanché Island. However, in addition to employing vertical red bands as panel dividers, wavy lines are also used to delineate decorative panels. Similar to sherds from Bullards' excavations, some tripod dishes have large areas of Maya Blue pigment.

Outside of the Petén lakes region, red-on-paste decoration occurs in northern Yucatán, Naco, Honduras, and the western Guatemalan highlands. Chompoxté Red-on-paste: Akalché Variety closely resembles that of Tecoh Red-on-buff (San Joaquin Buff ware) and Chumayel Red-on-slate and Canche Red-on-slate in northern Yucatán (Smith 1971:29, 44-45). At Naco, Honduras, Nolasco Bichrome resembles Chompoxté Red-on-paste: Akalché Variety pottery (Wonderley 1981:172). Many red-on-white types with banded decoration areas and curvilinear lines also exist in the western Guatemalan highlands (Wauchope 1970).

Name: Dulces Incised: Bebeto Variety

Frequency: One sherd from Zacpetén is the basis for this description. Dulces Incised: Bebeto Variety comprises one percent of the Topoxté ceramic group and .18 percent of the total sherds in the study.

Ware: Clemencia Cream Paste ware.

Established: Present work based on collections from Zacpetén.

Types of analysis: "Low-tech" (1 sherd); petrographic (1 sherd); x-ray diffraction (0 sherds); EDS and SEM and strong-acid extraction ICPS (0 sherds).

Principal identifying modes: 1) Pre-fire deep incisions; 2) Very pale brown marly paste; 3) Drums.

Paste and firing: The Dulces Incised: Bebeto Variety sherd is completely oxidized with a very pale brown (10YR 8/3) core color. Like other Topoxté ceramic groups, cryptocrystalline calcite dominates the fine marly paste. Other minerals in the clay matrix include euhedral and subhedral calcite, quartz, ferrougonous lumps (hematite), chert and biotite. The sherd was estimated to have been fired to 600°C and has a core hardness of 3 on the Mohs' hardness scale.

Surface finish and decoration: The exterior of the vessel has pre-fired deep incisions that appear approximately one centimeter below the rim and are approximately 1.25 cm in length. The sherd, although fragmentary, has a group of four incisions that suggests that the incisions may have been grouped around the circumference. The unslipped exterior surface is light gray (10YR 7/2) with a hardness of 3. The interior surface is also unslipped.

Forms and dimensions: The sherd represents a drum form. The neck is slightly flared and has a direct rim with a rounded lip. The rim diameter is 8 cm and the wall thickness is 6.36 mm.

Illustrations: Figure 44

Intrasite references: The Dulces Incised: Bebeto sherd was located in level 2 (collapse) of Structure 721 (temple) at Zacpetén. A grater bowl and other miscellaneous Dulces Incised: Bebeto Incised sherds not included in the study were located in Structure 719 (residence) at Zacpetén. No other sherds of this type were found in excavations at Ch'ich', Ixlú, or Tipuj.

Intersite references: Dulces Incised: Bebeto Variety is rare in the Petén Lakes region. The only other example of this type comes from recent excavations (1998) at Topoxté Island where I examined one grater bowl. Grater bowls show signs of use wear. This type of deep groove pre-fire incising is also common in other Petén ceramic groups:

Picú Incised: Thub Variety, Xuluc Incised: Tzalam Variety, and Hobonmo Incised: Hobonmo Variety.

Drums occur in northern Yucatán in the Mayapán Red ware (Smith 1971:22). Drums may also have begun in the Classic era. Individuals are seen on Late Classic polychrome vessels carrying and/or playing "drums."

Although this is a typological description of the five Postclassic slipped pottery groups, some significant differences begin to come to the foreground. Most of these

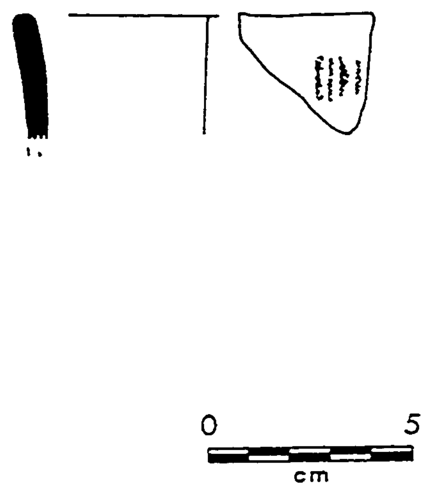


Figure 44: Dulces Incised: Bebeto Variety Rim Profile from Zacpetén.

differences are in terms of painted and incised decoration. In the Paxcamán and Topoxté ceramic groups, Ch'ich', Tayasal, and Tipuj lack a black-and-red painted decoration category (Sacá Polychrome and Canté Polychrome). In addition to this difference, Macanché Red-on-paste pottery only is found at Zacpetén and Flores Island. See Table 8 for a visual representation of the pottery types and varieties and the sites where they are located.

Decorative motif presence or absence is also interesting. As stated before, most of the Tipuj decorative motifs in the Paxcamán and Augustine ceramics involve the *ilhuitl* glyph. At Zacpetén, this motif appears three times and not at all at Ch'ich' and once at Ixlú. Prominent decorative motifs at Ch'ich', Ixlú, and Zacpetén are curls, chevron, and bird decorations.

The third most striking difference between the sites is the number of form categories. With the exception of Augustine group ceramics, Zacpetén has more form categories of Postclassic slipped ceramics. The vessels at Zacpetén, primarily jars, are also much larger in capacity than those at Tipuj, and Paxcamán tripod dishes at Macanché Island are smaller than those at any other site in the Petén lakes region.

Technology represents the fourth difference of Postclassic slipped ceramics at the sites in the Petén lakes region. There is a higher proportion of apparently overfired sherds in all three ceramic groups at Ixlú and Tipuj. Fireclouding colors also differ. At Tipuj, the majority of fireclouding of Augustine and Paxcamán ceramics is tan, whereas the prominent fireclouding color at Ch'ich', Ixlú, and Zacpetén is black. These differences may result form differences in the minerals used for slip pigment. In addition to differences in fireclouding colors, the Paxcamán, Trapeche, and Augustine ceramic

Table 8: Postclassic Types and Varieties and the Sites Where They are Located

	Ch'ich'	Ixlú	Zacpetén	Tipuj
Paxcamán Red: Paxcamán Variety	X	X	X	X
Paxcamán Red: Escalinata Variety	X	X*	X*	X
Ixpop Polychrome: Ixpop Variety	X	X	X	X
Sacá Polychrome: Sacá Variety		X	X	
Sacá Polychrome: Rasgo Variety			X	
Macanché Red-on-cream: Tachís Variety			X	
Macanché Red-on-cream: Macanché Variety			X	
Picú Incised: Picú Variety	X	X	X	X
Picú Incised: Thub Variety	X	X	X*	X
Picú Incised: Cafetoso Variety			X	
Fulano Black: Fulano Variety	X	X	X*	X
Sotano Red-on-paste: Sotano Variety		X	X	
Mengano Incised: Mengano Variety			X	
Trapeche Pink: Tramite Variety	X	X	X	
Mul Polychrome: Manax Variety			X	
Picté Red-on-paste: Ivo Variety			X	
Xuluc Incised: Tzalam Variety		X	X	
Augustine Red: Augustine Variety	X	X	X	X
Pek Polychrome: Pek Variety	X	X	X	X
Graciela Polychrome: Graciela Variety			X	
Hobonmo Incised: Ramsey Variety			X	X
Hobonmo Incised: Hobonmo Variety	X	X	X*	X
Johnny Walker Red: Black Label Variety				X
Topoxté Red: Topoxté Variety		X	X	X
Pastel Polychrome: Pastel Variety			X	X
Canté Polychrome: Canté Variety			X	X
Chompoxté Red-on-cream: Kayukos Variety			X	
Chompoxté Red-on-cream: Chompoxté Variety			X	X
Chompoxté Red-on-cream: Akalché Variety			X	X
Dulces Incised: Bebeto Variety			X	

X* indicates that the type and variety is present at the site, but was not used in this study.

group sherds have a translucent over-slip giving the exterior surfaces a "waxy" feel. Other than these differences, paste and slip variability are similar.

The differences suggested here are not numerous, but these small differences that may prove to be important when discussing the technological styles and social identity of groups in the central Petén lakes region. Two provisional macro-typological technological style groups can be defined. The first macro-group reflects the differences in ware categories. The sherds are discussed and grouped according to differences in wares that reflects differential selection of clays by the Postclassic Maya potter. Thus, the first macro-group can be divided into three smaller technological styles based on the ware categories (Volador Dull-Slipped, Vitzil Orange-Red, and Clemencia Cream Paste wares).

The second macro-typological technological groups reflects the differences in decorative modes. There are four painting modes (monochromatically slipped, red-on-paste , black-on-paste, and red-and-black) and two incising modes (fine- and broad-line incising). These decorative modes occur in most of the ware categories and reflect the stylistic choices made by the Postclassic Maya potter.

CHAPTER 6

"LOW-TECH" ANALYSES

This chapter represents the second level of analysis used to obtain pottery technological style group information. Analyzing sherds through visual examination, refiring experiments, and hardness measurements provides information as to Postclassic Maya technology. By beginning with "low tech" methods of pottery analysis, I can gather qualitative and quantitative data of the composition and structure of the entire pottery sample that is free from aesthetic judgments in order to evaluate its properties as well as possible Postclassic Maya operational choices of pottery manufacture. This type of analysis permits an unbiased evaluation of the pottery sample because I employ standard units of measurement, conduct experiments that can be easily replicated, and utilize statistical methods to evaluate the variability in the archaeological sample.

Choices made by the Postclassic Maya potter during the manufacturing and firing of pottery may result at any stage of the operational sequence. First, potters must obtain clay from a geological feature. They bring the clay back to the place of manufacture and may sort through it picking out various items such as larger rocks and organic materials. In addition to the initial cleaning of the clay, they may also levigate and/or seiving the clay to ride it of specific minerals. Once the clay is "clean," temper may be added to the clay to correct its stickiness, increase porosity, decrease shrinkage, and decrease deformation during drying. Water is then added to the clay and allowed to age to the state where it can be manipulated. When the clay is ready, the potter takes clay and forms coils and/or slabs and joins them in such a manner to produce vessel bases, walls, and rims. The body is smoothed through rubbing and/or pounding of the clay with some hand-held material (e.g. rocks or sticks) so that the coils/slabs are joined together producing a strong vessel. The completed vessel is placed out of the sun and wind and allowed to dry to the leather hard stage.

At the leather hard stage, the potter may choose to decorate the vessel. It may be smoothed, slipped, burnished, and/or incised. Slipping involves either wiping a colored clay mixture onto the vessel or the vessel may be placed into the slip. The slip may be smoothed or burnished at this point and is then allowed to dry as the vessel dries completely.

When the vessel is ready to be fired, the potter must gather enough material (wood, grasses, or any other agricultural product) for the firing process. The ground may be heated with a preliminary fire and the vessels may be placed around this fire so that they too are warmed. This process helps to lessen the stress from thermal shock cause by firing. When the ground and vessels are heated, the vessels are arranged in the fire and fuel is added until the vessels are fired. To produce a reducing atmosphere, grasses or other materials may be placed over the fire to smoother it and decrease the amount of oxygen present. After the firing, the vessels may be taken from the fire or they may be allowed to cool with the fire. Once they are cooled, the potter may apply a resin to the vessel to decrease porosity and/or they may incise decoration on the vessels.

Choices made at most of these stages can be detected by this level of analysis. Ultimately, this variability in the sample allows me to develop coherent groups based on paste, slip, and decoration characteristics from which I can suggest basic technological style characteristics that pertain to Postclassic slipped pottery from Ch'ich', Ixlú, Zacpetén, and Tipuj. Postclassic slipped pottery observations from Tayasal, Macanché Island, and Topoxté Island are included only in form and design analysis sections because of the inability to conduct refiring and hardness measurements.

I. Color Measurements

Slip colors provide much more information than simply color notation. If used with descriptive statistics, colors can suggest technological characteristics of pottery and the skill of manufacture. By coding color measurements and determining the degree of variablity, archaeologists can compare ceramic wares and groups, level of skill or quality control, inter-assemblage comparisons, and intersite comparisons (Frankel 1994:205).

This study of slip color measurements builds on Rice's (1980; 1987a) study of technological characteristics of Macanché Island pottery. Rice (1980) examined manufacturing characteristics (paste and slip) of Postclassic pottery from Macanché Island to suggest that the degree of skill increased throughout the Postclassic period, but that it never achieved the level seen in the Late Classic period. In the Early Postclassic period, potters were combining tan/cream slips with red slips to produce a "pink" slip. The high degree of fireclouding, incompletely oxidized pastes, and large variability in slip colors demonstrates that the Early Postclassic potters experimented with manufacturing techniques (Rice 1980:78-79; 1987a:113) . Potters of the Late Postclassic period achieved greater success by creating a clearer red slip with fewer fireclouds and less variability in paste characteristics. Rice concludes that although Postclassic potters may have made more "successful" pottery by the Late Postclassic period, they did not have a centralized mode of production typical of Monte Alban during the Postclassic period (Feinman, Upham, and Lightfoot 1981).

By employing measures of variance (richness, evenness, and heterogeneity), I suggest relative levels of potter's knowledge/skill at the archaeological sites of Ch'ich', Ixlú, Zacpetén, and Tipuj during the Postclassic period as well as the technology used to manufacture the five different pottery groups (Paxcamán, Fulano, Trapeche, Augustine, and Topoxté). The following color measurements and variability indices of slipped Postclassic period pottery test the hypothesis developed by Rice from Macanché Island; however, I examine pottery from the last occupation phase (Late Postclassic) at the four sites in this study. Initial observations suggest two differences from Macanché Island pottery: 1) the variability of "reds" runs from tan to pink to red to orange-red to dark purple; and 2) black slips occur in addition to red slips. These observations indicate a more diverse collection than what appears at Macanché Island, which is not unexpected given the larger sample.

I.A. Slip Colors With Regard to Archaeological Site (Figures 45 and 46)

Exterior and interior slipped surfaces are described below. Exterior slipped surface measurements are taken from the slip on the exterior surface and interior surface measurements are taken from a monochrome slip color that represents either a primary slip of a decorated sherd (the "creamy" to "orangish" slip over which the decoration is painted) or an interior red slip that resembles that of the exterior slip.

I.A.1 Zacpetén. Zacpetén's exterior and interior slips have a fairly wide range of red colors (10R, 7.5R, and 2.5YR) with the highest frequency of deep red colors occurring at Zacpetén when compared to Ch'ich', Ixlú, and Tipuj. More yellowish exterior colors (10YR and 7.5YR) reflect the inclusion of Trapeche sherds. Interior slips occur more frequently in the YR hues indicating the predominance of decorative types with primary slips in the study. Both exterior and interior slip colors vary.

I.A.2 Ixlú. While slip colors from Ixlú demonstrate a similar degree of variation as those from Zacpetén, most slips are red and not deep red. This clustering reflects the predominance of red slipped sherds and darker Trapeche pink slips. Although interior slip colors also occur more frequently in the red hues, another cluster occurs (7.5YR 7-5/4 and 5YR 6-5/4-6) indicating primary slips of the decorated types.

I.A.3 Ch'ich'. Slips from Ch'ich' do not show the range of variability as seen at Zacpetén and Ixlú. Exterior slips are red (10R and 2.5YR) with a few slip colors in the yellowish hue range. The relatively high number of red slips corresponds to the small number of decorated types present in Structure 188. Interior slips demonstrate a similar range described above with other primary slips.

I.A.4 Tipuj. Exterior slips from Tipuj exhibit the least variability of the four sites. The majority of the slips are red with some slips exhibiting yellowish hues. This color variation reflects the predominance of red and red-orange (10R and 2.5YR) slipped sherds of the

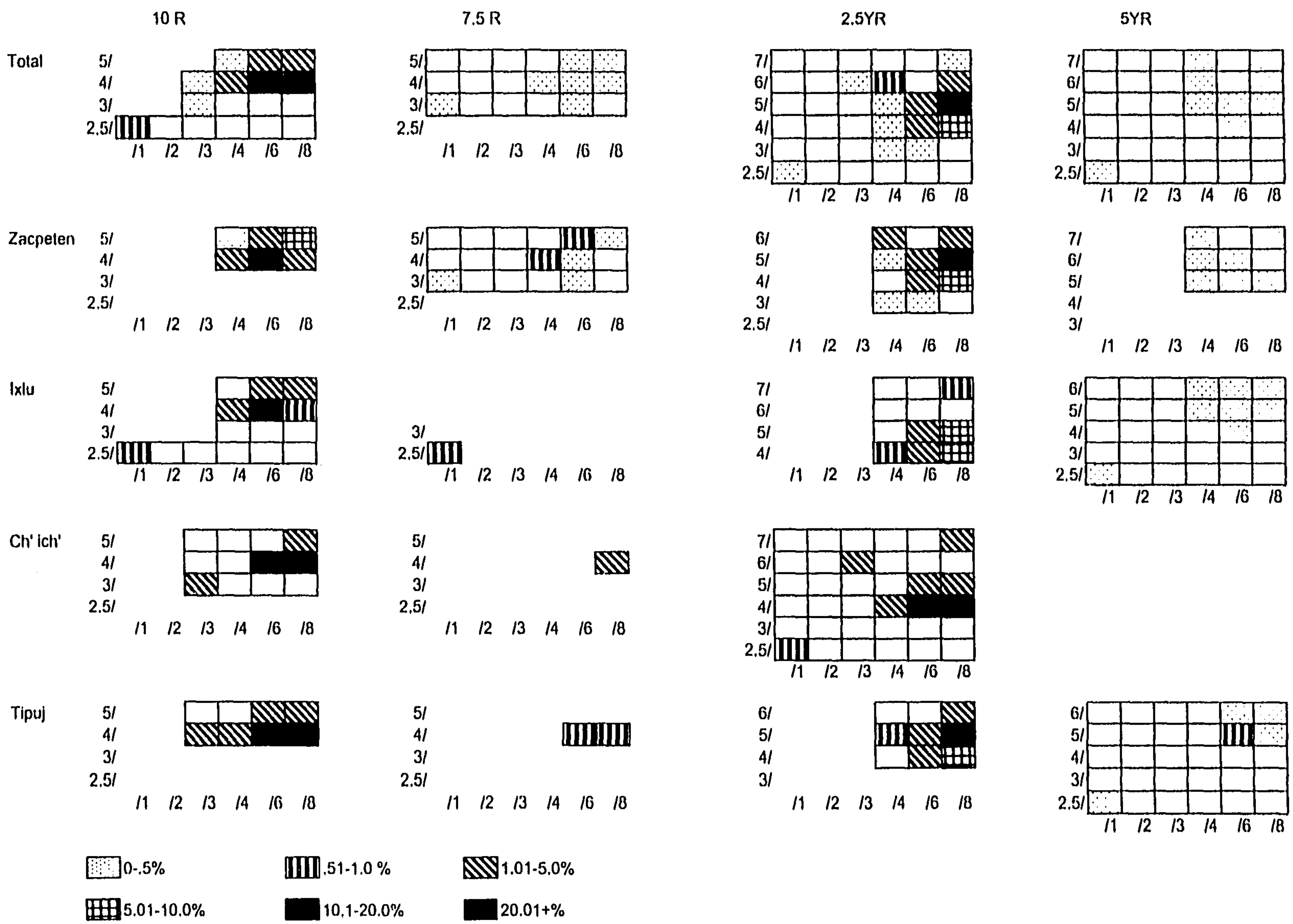


Figure 45: Exterior Slip Color Distribution According to Archaeological Site (figure continued on next page).

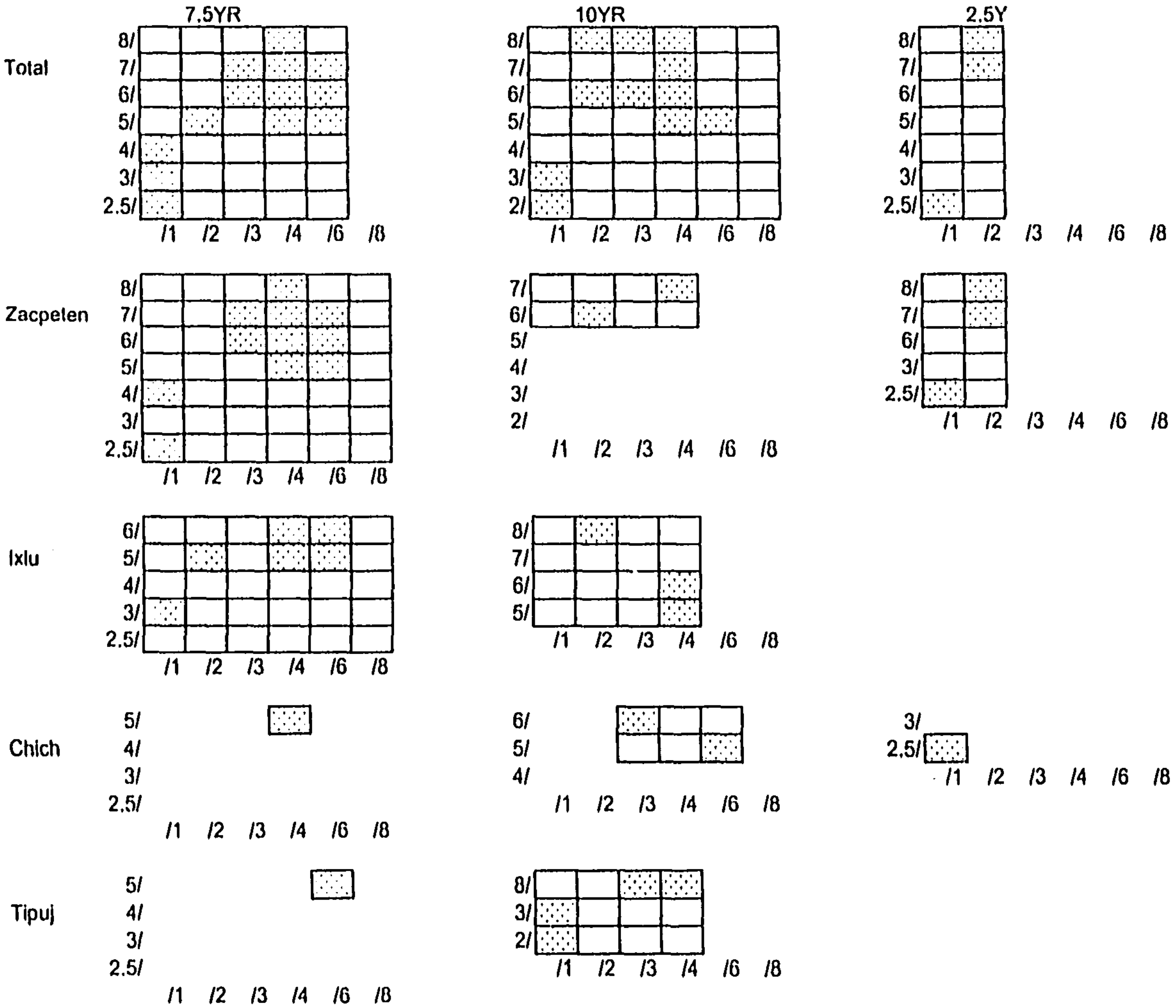


Figure 45: Exterior Slip Color Distribution According to Archaeological Site

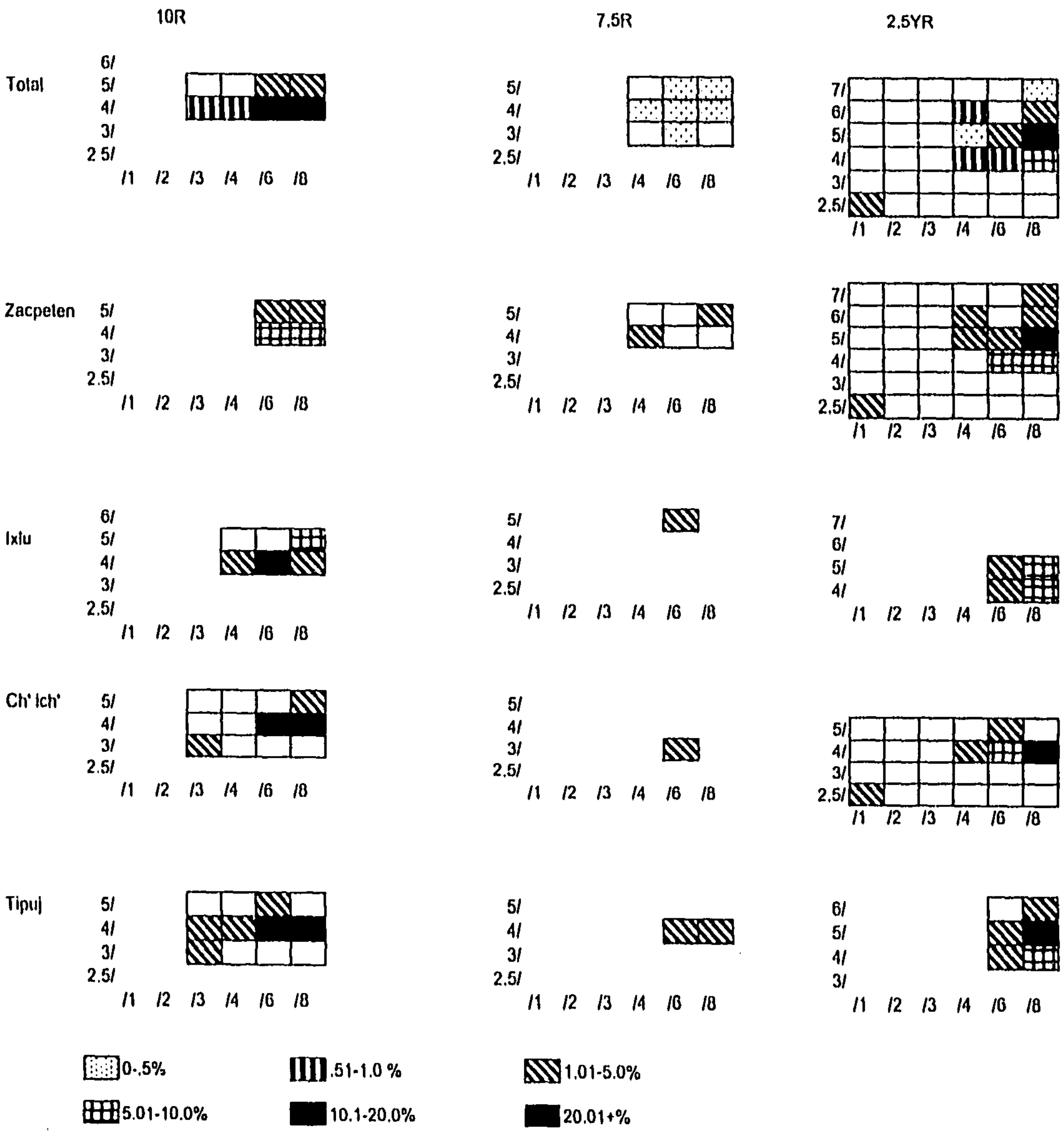


Figure 46: Interior Slip Color Distribution According to Archaeological Site (continued on next page)

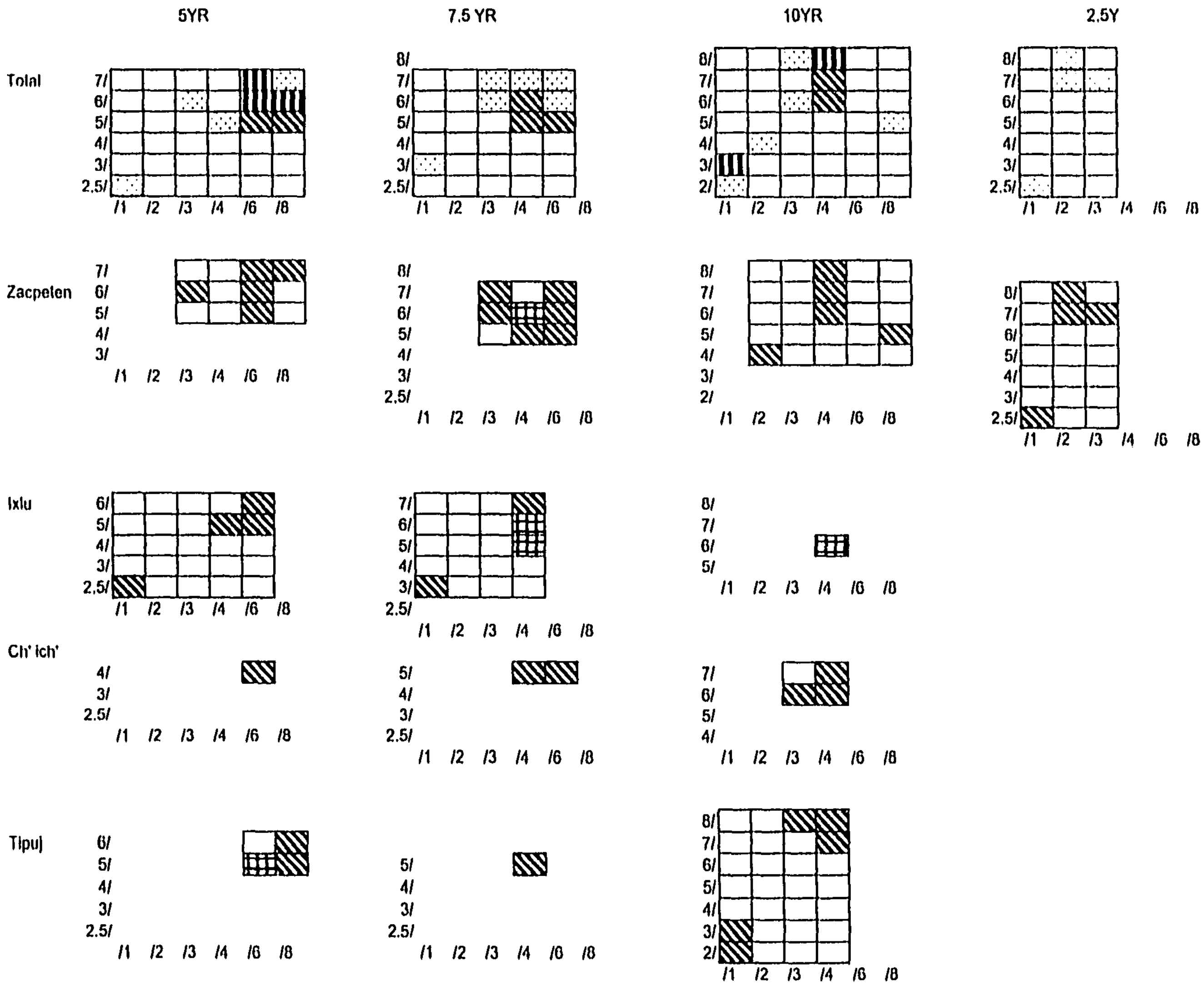


Figure 46: Interior Slip Color Distribution According to Archaeological Site

Augustine and Paxcamán ceramic groups and the absence of the Trapeche ceramic group at Tipuj. Interior slip color variation resembles that described above for Zacpetén, Ixlú, and Ch'ich' and reflects the predominance of decorated types.

I.B. Slip Colors With Regard to Ceramic Group (Figures 47 and 48)

Data used for the presentation of slip colors with respect to archaeological site is re-organized here to demonstrate the differences in exterior and interior slip colors according to the ceramic group.

I.B.2. Paxcamán Ceramic Group. Paxcamán exterior slip colors vary considerably with one cluster of the sample (approximately 1%) having a red (2.5YR 4/8) slip color. Interior slips also vary considerably. The high proportion of interior slips with a 10R hue indicates the high percentage of monochrome vessels at Tipuj and Ch'ich while the range of variability in the yellow color range indicates the diversity of primary slips on decorated sherds.

I.B.2 Fulano Ceramic Group. Not unexpectedly, all exterior surfaces and most interior surfaces of the Fulano ceramic group occur in the gray to black range (7.5R 3/1, 5YR, 7.5YR, 10YR, and 2Y 3-25/1). Although most interior surfaces occur in the gray to black range, few interior surface slip colors occur in lighter values and chromas indicating the lack of primary slips of decorated sherds that may be due to preservation.

I.B.3 Trapeche Ceramic Group. Exterior and interior slips demonstrate a similar variability as those of the Paxcamán ceramic group. Exterior slip colors occur in all Munsell color hue charts except 10R, but are most concentrated at the "pink" values and chromas typical of the Trapeche ceramic group (2.5YR 5/6). Interior slips reflect another

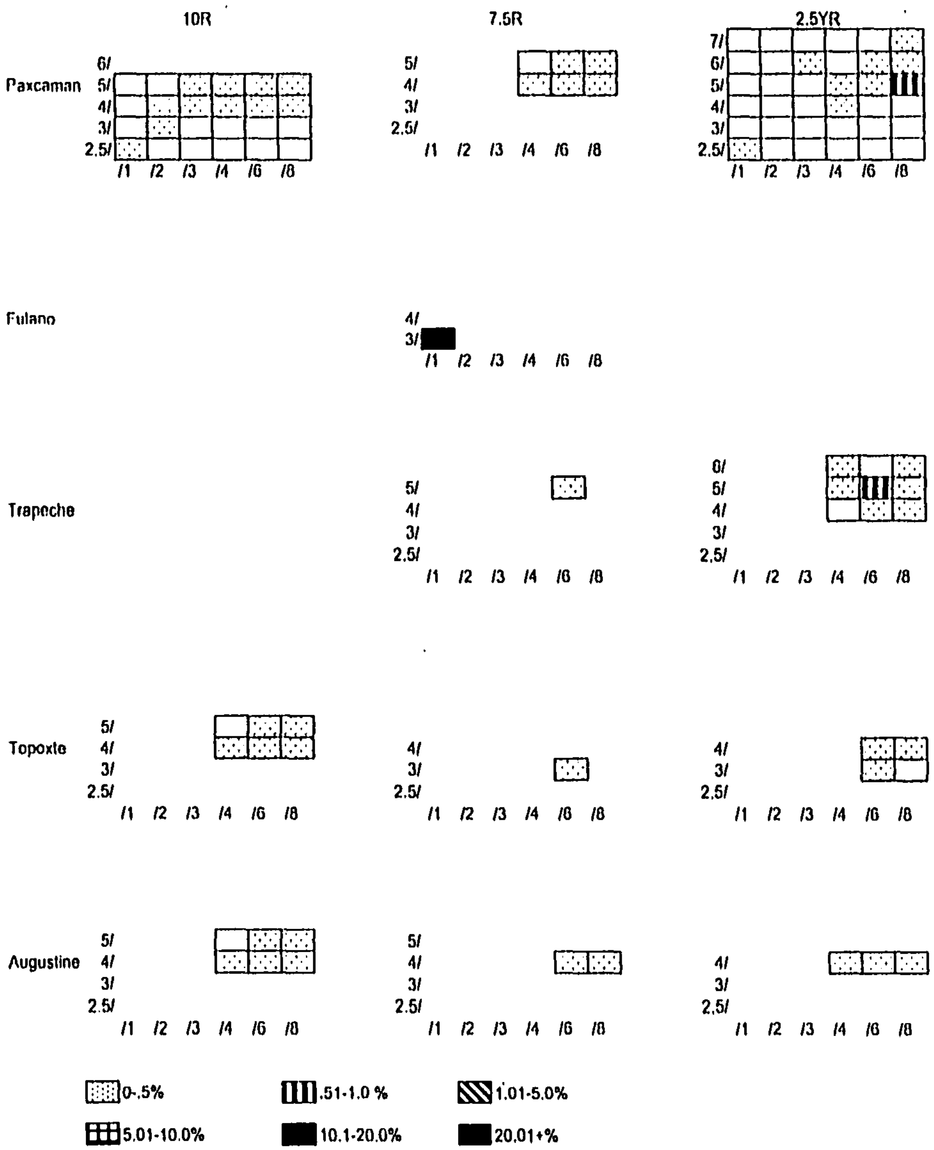


Figure 47: Exterior Slip Color Distribution According to Ceramic Group (continued on next page)

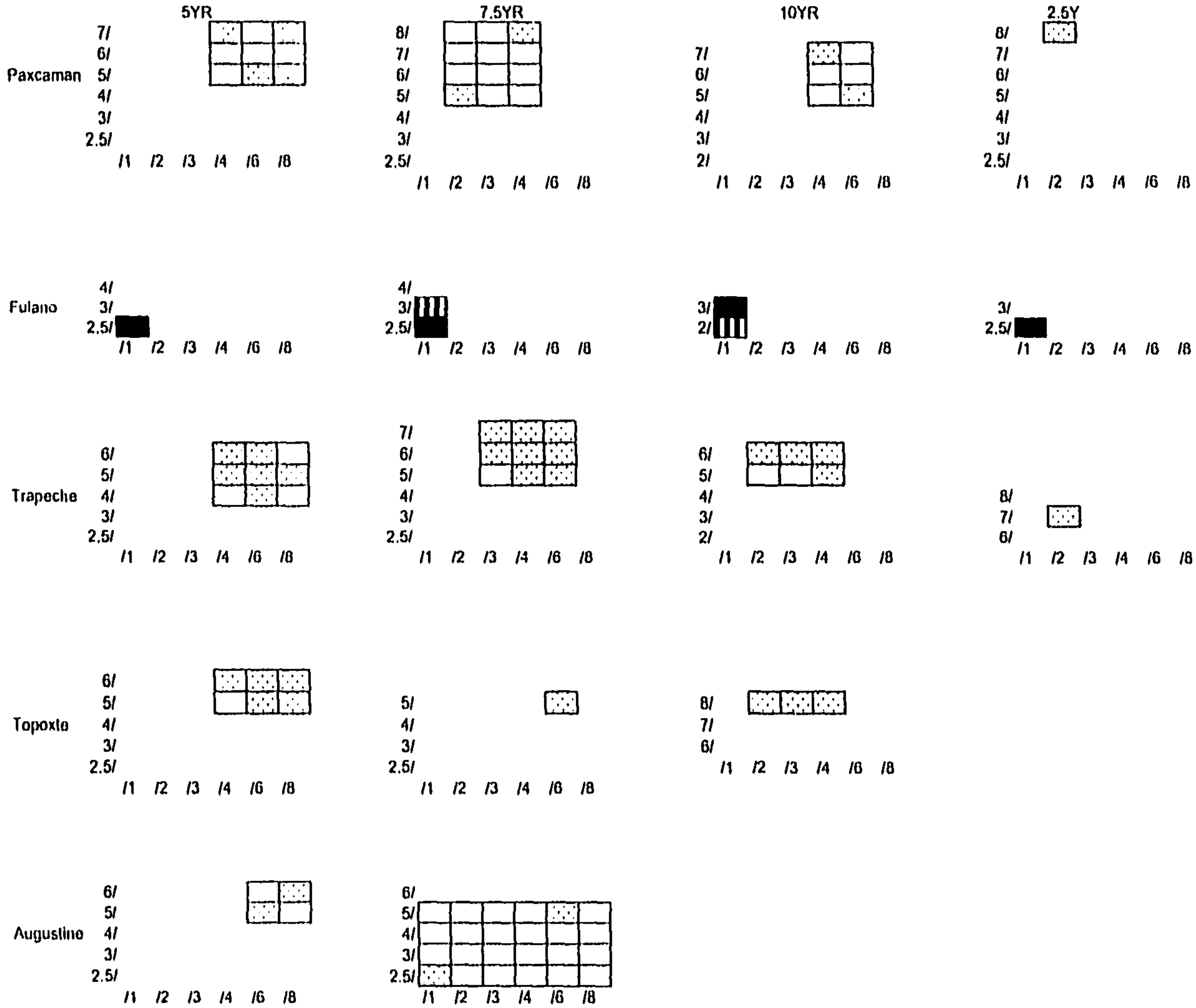


Figure 47: Exterior Slip Color Distribution According to Ceramic Group

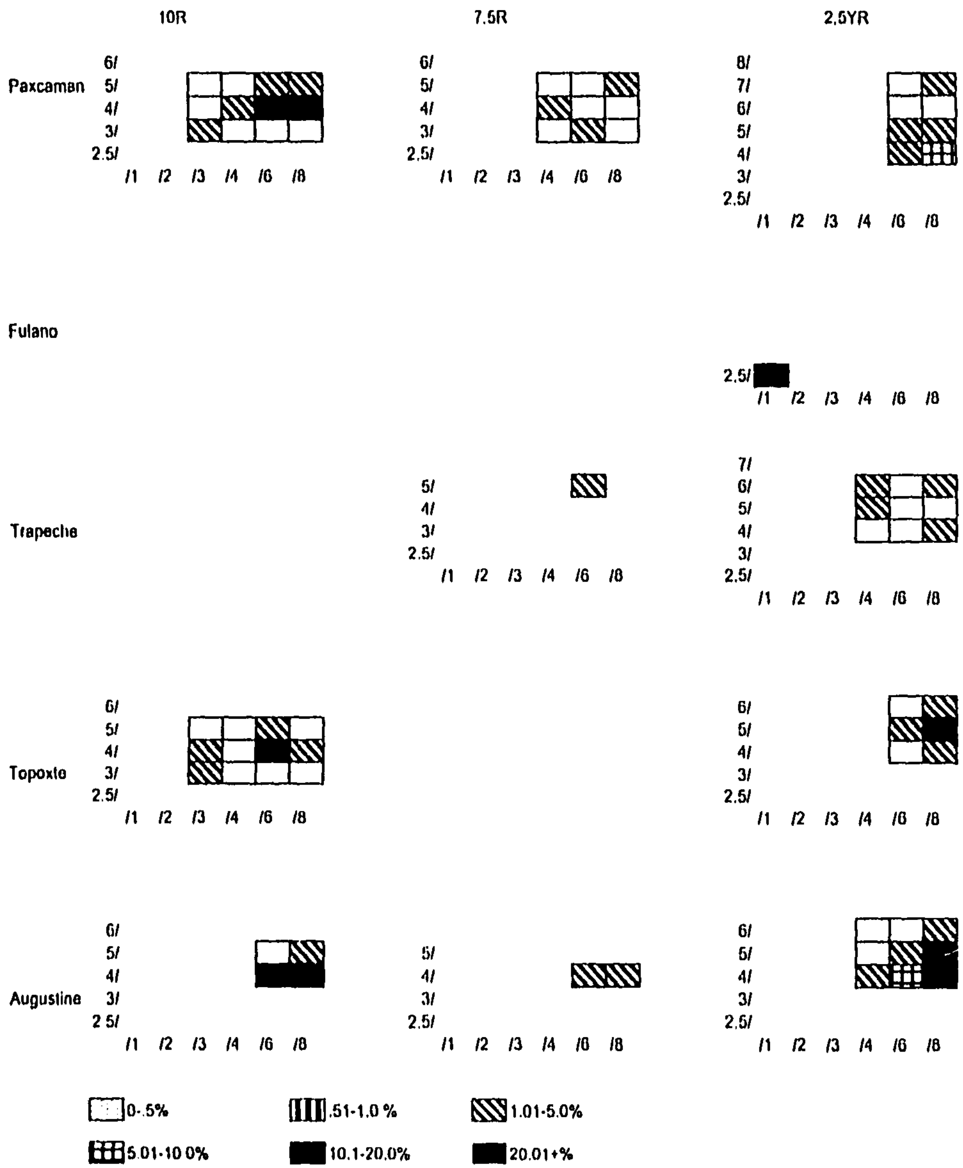


Figure 48: Interior Slip Color Distribution According to Ceramic Group (continued on next page)

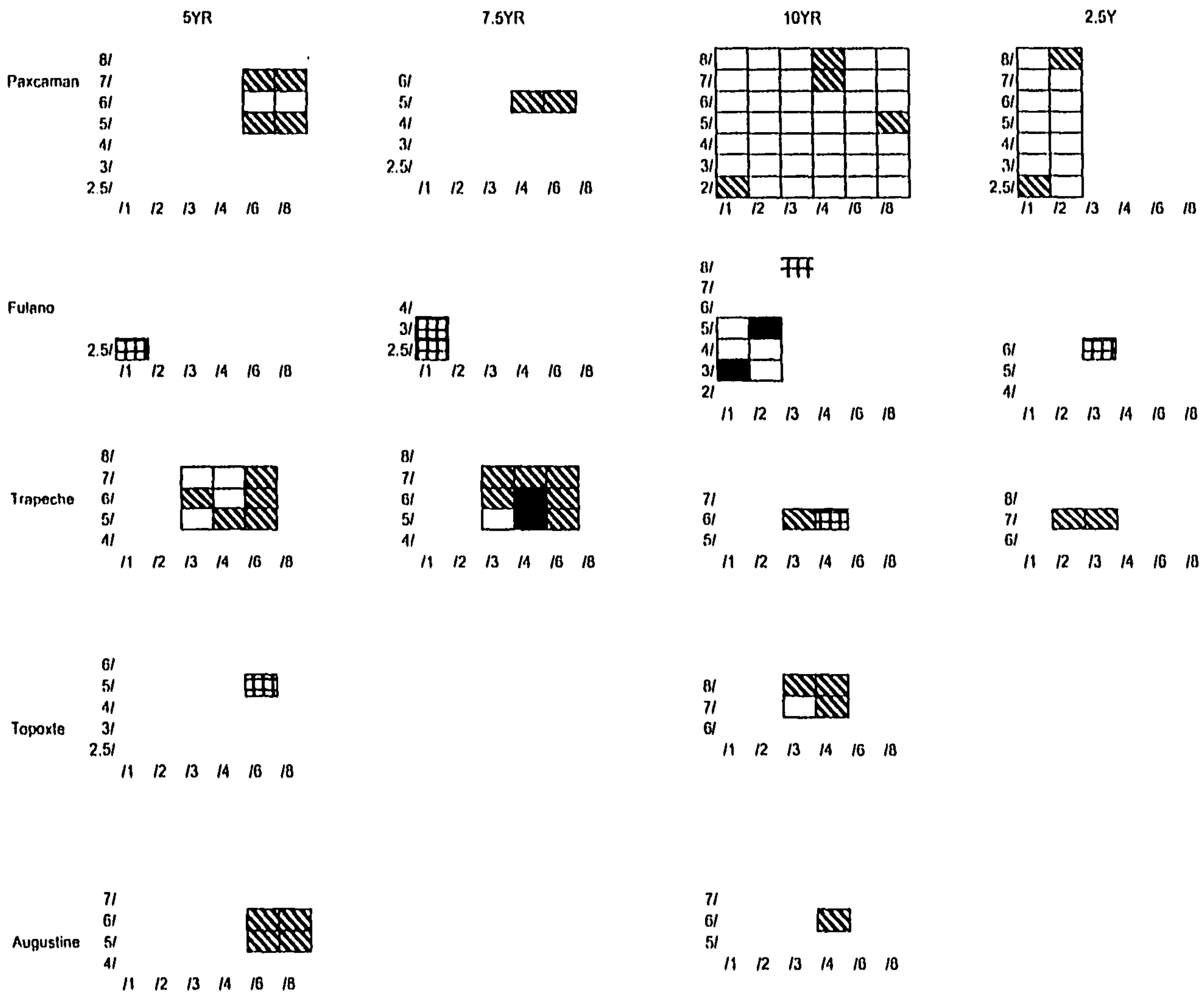


Figure 48: Interior Slip Color Distribution According to Ceramic Group

"pink" color (7.5YR 5-6/4) that defines the ceramic group. In contrast to other interior surface colors, this variation of interior slip colors does not reflect decorative panels (there are only 3 in the study), but instead reflects the variability in slip colors that occur in this group. As Rice (1980:75-76) states, "potters were trying to achieve two slip colors, a cream slip (Trapeche Group) and a red slip (Paxcamán Group). However, their relative lack of technological expertise is noteworthy. There is a considerable range of slip colors. For example, the intermediate tan and pink colors are common, as if the potters were not consistently able to achieve the same degree of oxidation in firing." This may account for the variability in the Trapeche ceramic group from Ch'ich', Ixlú, and Zacpetén.

I.B.4 Topoxté Ceramic Group. Topoxté slips show the same variability as described for the other ceramic groups with two notable exceptions. First, fewer interior and exterior colors occur in the yellowish to greenish hues (10YR, 2.5Y). Second, the difference in interior colors reflects the "whiteness" of the primary slip of the decoration panel.

I.B.5 Augustine Ceramic Group. Augustine exterior and interior slip colors provide a different pattern from the ones described above. Exterior slip colors occur in red or orange-red hues, values, and chroma and no slip colors occur in the 10YR and 2.5Y hues. Interestingly, the predominance of orange-red slips from Tipuj does not dramatically influence the distribution of exterior slip colors. Interior slip colors also cluster in the red and orange-red hues. The lack of a creamy primary slip for Augustine ceramics is evident in the lack of color measurements of the 7.5YR and 2.5Y hues.

I.C. Diversity of Color Measurements

Although diversity is apparent in Figures 45-48 for the archaeological sites and the ceramic groups, quantification of the data provides additional information as to the range of colors in the ceramic sample. In order to quantify the data, I make three assumptions in order to collect discrete variables and produce data that can be compared to other studies of this nature. First, "each color is discrete, and that the differences between them are always of the same degree" (Frankel 1994:212). In order to adhere to the first assumption, I assigned the single closest Munsell color to the slip color and did not assign a series of values or chromas (e.g., 10YR 5-6/1-2). Second, although a multitude of richness, evenness, and heterogeneity formulae exist, I selected the ones that are most appropriate for the present pottery sample. Formulae used in this section are described in detail in Chapter 4. The formulae were also selected for comparability with other published data. Third, sample size will affect the measures of diversity, but not to such an extent that the results will be nullified.

Richness, evenness, and heterogeneity were calculated to determine the diversity of the pottery sample. Richness measures the number of colors present and the sample size. A high richness indicates high variability. Evenness determines the degree to which the sample has an equal proportion of colors in the assemblage. A high evenness number (closer to 1) indicates a mixed assemblage with many colors and a low evenness number (closer to 0) indicates a uniform or homogeneous sample (Frankel 1994:213). Heterogeneity combines the measures of richness and evenness to suggest the complexity of the sample. High heterogeneity (closer to 1) indicates a wide range of colors and low heterogeneity indicates a sample whose colors are very similar.

Based on the measurements of diversity (Tables 9 and 10), several trends occur. These data appear to support Rice's (1980; 1987a) work that states that Postclassic ceramics are not the result of specialized production but instead the result of multiple potters with varying degrees of skill. Richness measurements indicate that slip colors on pottery from Zacpetén and Ixlú are the most diverse with regard to interior and exterior slip colors. This may be influenced by the inclusion of all five of the ceramic groups at the two sites. Ch'ich' and Tipuj have lower richness indices for both surfaces, but some diversity in slip colors occurs. With regard to ceramic groups, the Trapeche ceramic group has the highest richness measurement of exterior and interior slips that may reflect the experimental nature of the slip as stated above. Paxcamán and Topoxté ceramic group exterior and interior slips and the Fulano ceramic group interior slips richness indices are lower than those of the Trapeche ceramic group. Finally, the Augustine ceramic group exterior and interior slipped surfaces and the Fulano ceramic group exterior surfaces have the lowest richness indices suggesting that the slip colors are relatively more uniform. Richness measurements, however, may be skewed by the overwhelming similarities of slip colors for the Augustine ceramic group at Tipuj that accounts for one-third of the sample.

Relatively high evenness indices demonstrate that the exterior and interior slipped surfaces at all sites and all ceramic groups in the study exhibit a mixed assemblage with many colors. Tipuj's interior surfaces and Ch'ich's and Ixlú's exterior surfaces are relatively lower. Although lower indices exist, the values remain high enough to reflect a mixed assemblage of colors. However, the Augustine ceramic group exterior surface has the lowest evenness measurements which may suggest some degree of control in the

Table 9: Diversity Measurements of Interior Slip Colors

	Sample Size	Total Number of Colors Recorded	Number of Colors Consisting of More than 1.0% of the Sample	Richness	Evenness	Heterogeneity
Zacpetén	76	36	36	4.13	.74	.96
Ixlú	40	19	19	3.00	.69	.90
Ch'ich'	41	15	15	2.34	.62	.89
Tipuj	86	21	21	2.26	.54	.89
Paxcamán	85	29	29	3.15	.61	.89
Fulano	12	8	8	2.31	.70	.93
Trapeche	40	22	22	3.48	.79	.93
Augustine	95	16	16	1.64	.76	.84
Topoxté	19	13	13	2.98	.82	.94

Table 10: Diversity Measurements of Exterior Slip Colors

	Sample Size	Total Number of Colors Recorded	Number of Colors Consisting of More than 1.0% of the Sample	Richness	Evenness	Heterogeneity
Zacpetén	180	44	23	3.27	.62	.70
Ixlú	114	30	16	2.81	.57	.84
Ch'ich'	68	18	15	2.18	.51	.84
Tipuj	124	24	12	2.07	.75	.86
Paxcamán	171	34	17	2.60	.77	.83
Fulano	14	7	7	1.87	.93	.88
Trapeche	70	27	11	3.23	.88	.94
Augustine	143	17	10	1.42	.70	.84
Topoxté	101	21	21	2.09	.83	.88

manufacture of the pottery or it may be skewed by the sample from Tipuj.

Heterogeneity indices suggest that the sample's slip color is composed of many colors. Tipuj's exterior surfaces have a higher index as compared to those of Zacpetén, Ixlú, and Ch'ich'. Trapeche ceramic group exterior surfaces, as well as the Topoxté ceramic group's interior surfaces, have a high heterogeneity. The heterogeneity index for the Topoxté ceramic group's interior surfaces may reflect differences in primary slip colors that range from red to white. Other than these two differences, the Paxcamán, Fulano, Augustine, and Topoxté ceramic group exterior surfaces have high diversity indices.

Taken together, the slip color measurements presented above support Rice's (1980) initial observations that Postclassic pottery reflects pottery that was manufactured by multiple people with varying degrees of skill. The Augustine ceramic group may be an exception because of its lower indices suggesting a relatively more standardized production. However, Augustine production by no means reflects a true specialized mode of production. Postclassic potters may have been better able to create an orange-red slip than a red or pink slip. Nevertheless, Postclassic pottery in the Petén lakes region is highly variable with regard to slip color.

II. Original Hardness

Firing temperature, time, and atmosphere determines the hardness of pottery (Rice 1987b:354-355). Hardness can also measure "the porosity, grain-size distribution, post-depositional environment and mineral composition" of archaeological pottery (Orton, Tyers, and Vince 1993:138). Although hardness measurements have the potential to quantify a great deal of data, the data are ordinal data and cannot be examined by statistical procedures that involve a sample or population mean. However, mode, median, and range descriptive statistics provide considerable insight into this sample of Postclassic slipped pottery.

Tables 11-16 display mode, median, and range information of hardness of interior, exterior, and core surfaces. In general, interior surface hardness measures the hardness of the primary slip of the decorated area. Exterior surface hardness measures the slipped surfaces, and core hardness indicates the paste hardness. I took core hardness measurements on a freshly cut surface so that the jaggedness of a freshly broken sherd did not influence the hardness measurement. Tables 11-13 represent hardness demonstrating the differences of all pottery groups by site and Tables 14-16 represent hardness with regard to the ceramic group.

Hardness measurements with regard to the archaeological site where the sherd was excavated provided some trends. Interior surfaces at Zacpetén demonstrate the most variety, resulting from the high quantity of decorated sherds in the sample. Core hardness is more variable at Ch'ich' and Ixlú than at Zacpetén and Tipuj. The difference may result from more overfired sherds at Ch'ich' and Ixlú. Exterior surfaces from Tipuj have the softest surfaces of the four archaeological sites, and all sites except Ch'ich' demonstrate a two point range.

Table 11: Interior Surface With Regard to Archaeological Site

	Median	Mode	Range (Min.-Max)
Zacpetén	2	2	2-4
Ixlú	2	2	2-3
Ch'ich'	2	2	2-3
Tipuj	2	2	2-3

Table 12: Exterior Surface with Regard to Archaeological Site

	Median	Mode	Range (Min.-Max)
Zacpetén	3	3	2-4
Ixlú	3	3	2-4
Ch'ich'	2	2	2-3
Tipuj	2	2	1-3

Table 13: Core Hardness with Regard to Archaeological Site

	Median	Mode	Range (Min.-Max)
Zacpetén	3	3	2-3
Ixlú	3	3	2-4
Ch'ich'	3	3	2-3
Tipuj	3	3	2-4

Table 14: Interior Surface Hardness with Regard to Pottery Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	2	2	2-3
Fulano	2.5	3	2.5-3
Trapeche	2	2	2-3
Augustine	3	3	2-4
Topoxté	2	2	2-3

Table 15: Exterior Surface Hardness with Regard to Pottery Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	2	2	2-4
Fulano	3	3	2-3
Trapeche	2	2	2-3
Augustine	3	3	1-4
Topoxté	3	3	2-3

Table 16: Core Hardness with Regard to Pottery Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	3	3	2-3
Fulano	3	3	3-3
Trapeche	3	3	2-3
Augustine	3	3	2-4
Topoxté	3	3	2-4

When sherd hardness is examined with regard to ceramic group, some interesting trends also occur. Augustine and Fulano ceramic group interior surfaces are relatively harder than other interior surfaces. This results from more interior surfaces being monochrome slipped than decorated. The range of exterior slips is larger in the Paxcamán and Augustine ceramic groups, reflecting more variety of slips and/or different depositional contexts. The Augustine and Fulano ceramic groups represent the two largest samples of exterior slips that range from a "waxy" slip with high (4) hardness measurements to a soft, easily eroded slip (2).

While cores of the five ceramic groups have similar median and mode statistics, the range provides some differences. The differences correlate to differences seen in paste characteristics described in Chapters 4 and 5. Augustine and Topoxté ceramic groups have three categories of clay pastes. Augustine ceramic group clay pastes are either dominated by pores, dominated by calcite, or a mixture of calcite, chalcedony, and biotite. Topoxté ceramic group sherds also form three clay paste groups: 1) dominated by pores; 2) calcite and biotite; and 3) calcite, biotite, and chalcedony. Hardness differences may be the result of the different clay pastes and demonstrate that the technology involved in pottery production affects the hardness of a vessel.

In general, hardness measurements of Petén Postclassic slipped pottery are low. The low hardness measurements support the refiring experiments that demonstrate low estimated firing temperatures (300-600°C). These data, together with color measurement diversity, suggest that Postclassic pottery manufacturing was not well controlled.

III. Firing Conditions

III.A. Atmospheric Conditions

Time, temperature, and atmosphere affect the appearance of pottery. In order to reconstruct prehistoric firing conditions (time, temperature, and atmosphere), the archaeologist examines core variation and conducts refiring experiments. Cores observed from a freshly broken sherd provide information as to oxidizing and reducing firing atmospheric conditions and refiring experiments (discussed below) suggest possible firing temperatures and clay and slip characteristics (e.g., color and hardness). Rye (1981:114-118) provides descriptions and figures from which archaeologists can compare data and obtain ordinal data for analysis. Of his four categories of firing atmospheres and amount of organics present in the sherd described by Rye, only three occur in the present study.

Paxcamán and Trapeche ceramic group sherds were fired in an oxidizing atmosphere and the resulting sherd had organic material present (a darker gray zone) in the core (Rye 1981:115). The medium to dark gray clay pastes contain a great deal of organics that burn out by 800°C (see below) resulting in a dark buff or light gray clay paste. Most of the sherds in the two ceramic groups were incompletely oxidized as evident by comparing cores to Figure 2. According to Rye (1981:115), dark gray clay pastes with no core (Figure 2-1) and dark cores with lighter margins (Figure 2--3, 4) indicate pottery that was not completely oxidized and contained at least 10 percent organic material.

On the other hand, most Augustine and Topoxté ceramic group pottery in the present sample represents firing in an oxidizing atmosphere with little to no organic material present in the clay (Rye 1981:115). Their cores (Figure 2–2) have a uniform color. However, some Augustine group ceramics also have cores that are half oxidized and half unoxidized (Figure 2–5).

The third type of firing atmosphere occurs in the Fulano ceramic group. The Fulano ceramic group sherds represent a reducing atmosphere with organic material present (Rye 1981:116). These cores have darker margins and a lighter "core." Refiring experiments (described in Chapter 5 and below) indicate that the black slip is the result of a reducing atmosphere.

In addition to oxidizing and reducing atmospheric conditions, some cores demonstrate the effects of cooling during the firing procedure. Rye (1981:117) suggests that if pottery was originally fired in a reducing atmosphere and allowed to cool in the open air, a thin, sharp layer of lighter clay color will occur near the surface. This occurs in some Fulano ceramic group sherds. The second effect of cooling appears on three Paxcamán and two Augustine sherds (Figure 2–8). A "striped" core is the result of a series of oxidizing and reducing atmospheres during firing. According to Rye (1981:118), the stages are as follows: "1) heating under reducing or non-oxidizing conditions, preserving a dark core of unburned organics; 2) oxidizing above about 600°C, removing organics adjacent to the surfaces but leaving the core unaffected; 3) reducing for a time sufficient for carbon deposition to blacken the surface but not to eliminate the oxidized zone; and 4) removing the vessel from the fire and allowing it to cool rapidly in air so only the surface layer (about 1 mm thick) is oxidized."

Tables 17 and 18 present frequencies of cores based on Figure 2 with regard to archaeological site and ceramic group. The majority of sherds from all sites and ceramic groups occur in the first three categories of fired core descriptions. Dark cores are the next most abundant core category, and finally, cores that are a result of extreme cooling are the rarest.

In addition to determining the atmosphere at which vessels were fired, comparison of median, mode, and range data of fired cores (based on Figure 2) provides measures of central tendencies that demonstrate differences among archaeological sites and among ceramic groups (Tables 19 and 20). While pottery cores from all sites have a median value of 2, mode and range values differ. Zacpetén, Chi'ch', and Tipuj exhibit the widest range reflecting the incorporation of most of the Postclassic ceramic groups. The data from Zacpetén represents a bimodal distribution between core types 1 and 2. The bimodal distribution reflects the inclusion of Volador Dull-Slipped and Clemencia Cream wares. Cores from Ixlú represent a multi modal distribution reflecting the presence of oxidized Augustine group ceramics and completely unoxidized or partially oxidized Paxcamán, Fulano, and Trapeche ceramic group pottery. Ixlú cores have the smallest range of core variability resulting from the lack of variability in the Augustine ceramic group sherds and sherds fired in a reducing atmosphere.

With regard to ceramic group, variability occurs at all levels (Table 20). Paxcamán group ceramics have a median and a mode similar to Trapeche group ceramics, but Paxcamán group sherds reflect a larger range of variation in types of cores. Both ceramic groups have a bimodal distribution. The Fulano ceramic group also

Table 17: Comparison of Firing Core Variation (see Figure 2) with Regard to Archaeological Site

	Zacpetén	Ixlú	Ch'ich'	Tipuj
1	71	35	30	24
2	95	31	17	73
3	27	40	0	23
4	0	2	6	7
5	8	9	8	14
6	4	0	0	6
7	0	0	0	1
8	2	0	1	3

Table 18: Comparison of Firing Core Variation by Pottery Group

	Paxcamán	Fulano	Trapeche	Augustine	Topoxté
1	108	6	47	0	0
2	0	0	0	123	98
3	45	4	20	18	9
4	10	1	2	1	0
5	17	1	1	11	11
6	4	1	0	1	0
7	1	1	0	0	0
8	3	0	0	2	0

Table 19: Core Variation Statistics with Regard to Archaeological Site

	Median	Mode	Range (Min.-Max.)
Zacpetén	2	1, 2	1-8
Ixlú	2	1,2,3	1-4
Ch'ich'	2	1	1-8
Tipuj	2	2	1-8

Table 20: Core Variability Statistics with Regard to Ceramic Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	1	1, 3	1-8
Fulano	3	1,3	1-7
Trapeche	1	1,3	1-5
Augustine	2	2	2-8
Topoxté	2	2	2-5

demonstrates a bimodal distribution and a large range of variation. Paxcamán, Fulano, and Trapeche ceramic group (Volador Dull-Slipped ware) measures of central tendency contrast to those of the Augustine and the Topoxté ceramic groups. Both ceramic groups have a unimodal distribution. Augustine group ceramics have a large range and Topoxté group ceramics demonstrate the smallest range. The small range of core variability of the Topoxté ceramic group may reflect a higher degree of skill in manufacture and/or better control of firing conditions. These data support data obtained in the examination of color diversity.

III.B. Firing Temperatures

Refiring pottery in a controlled setting produces two types of data: the determination of the original clay color and an estimate of temperatures at which the sherd was originally fired. According to Rice (1987b:344), by refiring sherds to 800°C for 30 minutes, one can better determine the original clay color. If this assumption is true, Volador Dull-Slipped ware clays were originally pink (2.5YR 7/6; 5YR 8/3-4; 7.5YR 8/3) to reddish yellow (5YR 7/6; 7.5YR 7/6). Clemencia Cream ware sherds were composed of a white to pink (7.5YR 8-7/2-3) to very pale brown (10YR 8/2-3) clay. Finally, Vitzil Orange-Red ware sherds were composed of a reddish brown (2.5YR 5/4) to light red (2.5YR 6/6) to red (2.5YR 5/6) to yellowish red (5YR 7-6/6) clay.

I conducted laboratory refiring experiments to estimate the approximate (within 50°C) original firing temperature. Table 21 provides counts and frequencies of the number of sherds according to archaeological site and ceramic group that were estimated to have been fired at the following temperatures: 300°C, 400°C, 500°C, 550°C, 600°C, 650°C, 700°C, and 800°C.

After being refired to 800°C in an oxidizing atmosphere, only 38 sherds (7%) exhibited dark cores. The majority of the remaining dark cores (29; 5%) occurred in the gray paste sherds (Volador Dull-Slipped ware). The remaining five percent were evenly distributed throughout the orange paste (Vitzil Orange-Red ware) and the cream paste (Clemencia Cream Paste ware) sherds.

The data suggest that while most sherds from the four sites are estimated to have been fired to 550-600°C, at least 25 percent of the sherds were fired at relatively low temperatures (300°C). The low estimated firing temperatures and the wide distribution of different firing temperatures supports the proposition that Postclassic pottery in the Petén lakes region resulted from varying firing technologies that may have included bonfire firing. The data also suggest that there was not a great deal of control over firing temperatures.

An examination of the firing temperatures with regard to ceramic group demonstrates similar trends as seen in the data grouped by archaeological site. Again, a bimodal pattern occurs: one cluster at 300°C and one cluster at 550-600°C. In addition to the bimodal distribution, more Paxcamán and Augustine ceramic group sherds were fired at temperatures above 650°C. The relatively low number (n=12) of sherds fired at higher temperatures (700°C and over) may be the result of "firing accidents."

Table 21 : Estimated Firing Temperatures (°C)

	300	400	500	550	600	650	700	800
Zacpetén	55 (26%)	4 (2%)	7 (3%)	43 (21%)	52 (25%)	43 (21%)	3 (1%)	3 (1%)
Ixlú	38 (32%)	3 (3%)	3 (3%)	28 (23%)	33 (28%)	9 (8%)	3 (3%)	0
Ch'ich'	13 (18%)	13 (18%)	1 (1%)	29 (40%)	10 (14%)	5 (7%)	0	2 (2%)
Tipuj	32 (21%)	0	3 (2%)	42 (28%)	47 (31%)	25 (17%)	1 (1%)	0
Total	138 (25%)	20 (4%)	14 (3%)	142 (26%)	142 (26%)	82 (14%)	7 (1%)	5 (1%)
Paxcamán	33 (18%)	17 (9%)	5 (3%)	56 (31%)	45 (24%)	23 (12%)	6 (3%)	0
Fulano	1 (7%)	2 (14%)	0	9 (65%)	2 (14%)	0	0	0
Trapeche	14 (20%)	0	1 (2%)	32 (45%)	20 (28%)	3 (5%)	0	0
Topoxté	31 (25%)	3 (4%)	8 (6%)	25 (20%)	36 (30%)	19 (15%)	0	0
Augustine	57 (33%)	3 (2%)	8 (4%)	25 (15%)	38 (22%)	36 (21%)	2 (1%)	4 (2%)

From the above data concerning original clay color and refiring temperatures as well as general typological characteristics described in Chapter 5, it can be said that Postclassic potters utilized local clays to create all pottery forms and many Petén Postclassic potters shared a general firing technology that varied with regard to the potter's skill.

III.C. Refired Color Diversity at 800°C

Slip color distribution variability (Figures 49 and 50) and color diversity statistics of refired sherds may provide additional information as to the degree of variation in the pottery sample. Again, the comparison is based on sherds fired at 800°C. Table 22 provides richness, evenness, and heterogeneity statistics with regard to archaeological site and ceramic group. By examining the refired exterior slip surface colors, one can better compare the effects of time, temperature, and atmospheric conditions of the sherds across archaeological sites and ceramic groups because all sherds were fired to 800°C allowing comparisons at the same time, temperature, and atmosphere.

Generally, richness values decrease when refired sherds are compared to the original sherds. This is not unexpected because as the organic matter present in the clay paste is burned out, there is a reduction of low values and chromas resulting in lower richness values. Sherds from Ch'ich' and the Fulano and Topoxté ceramic groups provide the only exceptions. Richness values of ceramics from Ch'ich and from the Fulano and Topoxté ceramic groups increase substantially. The increase in the Fulano ceramic group reinforces the idea that the Fulano ceramic group black slips resulted from 6.6

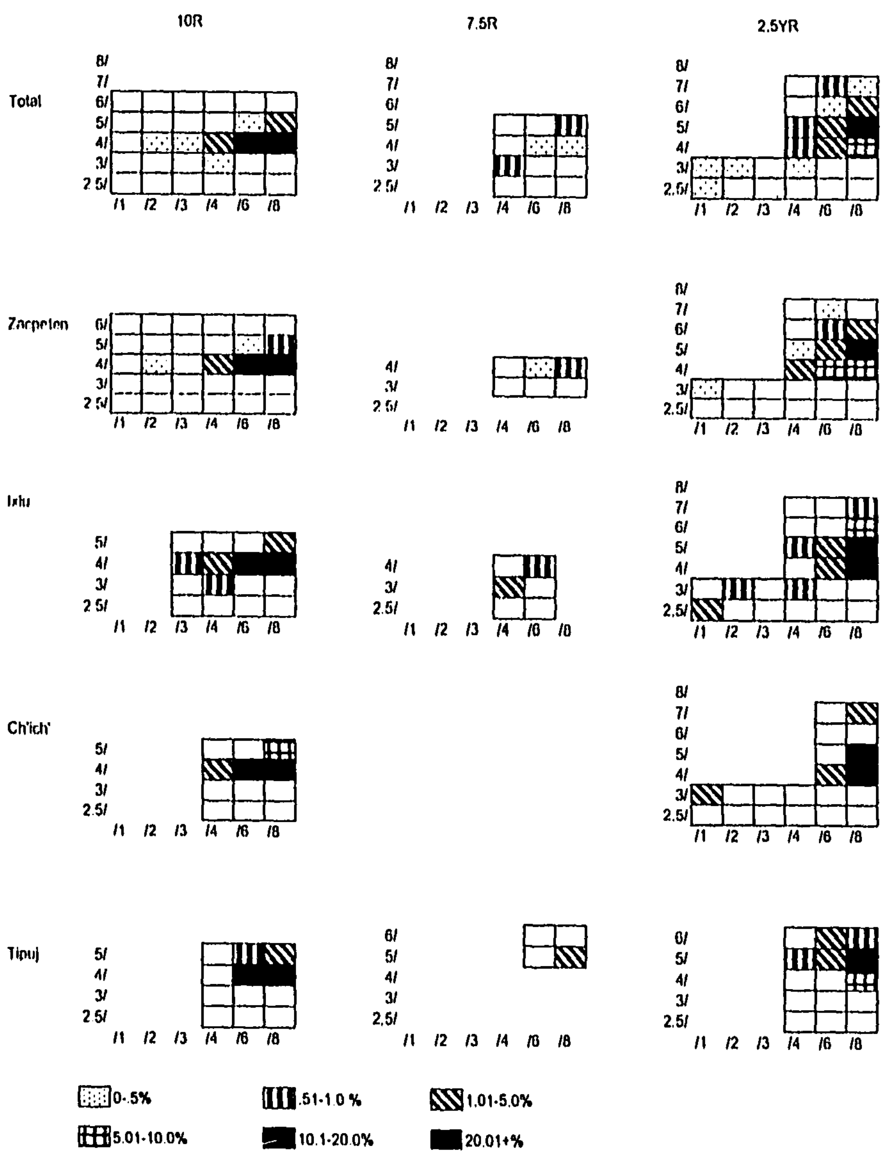


Figure 49: Refired Exterior Slip Color Distribution According to Archaeological Site (continued on next page)

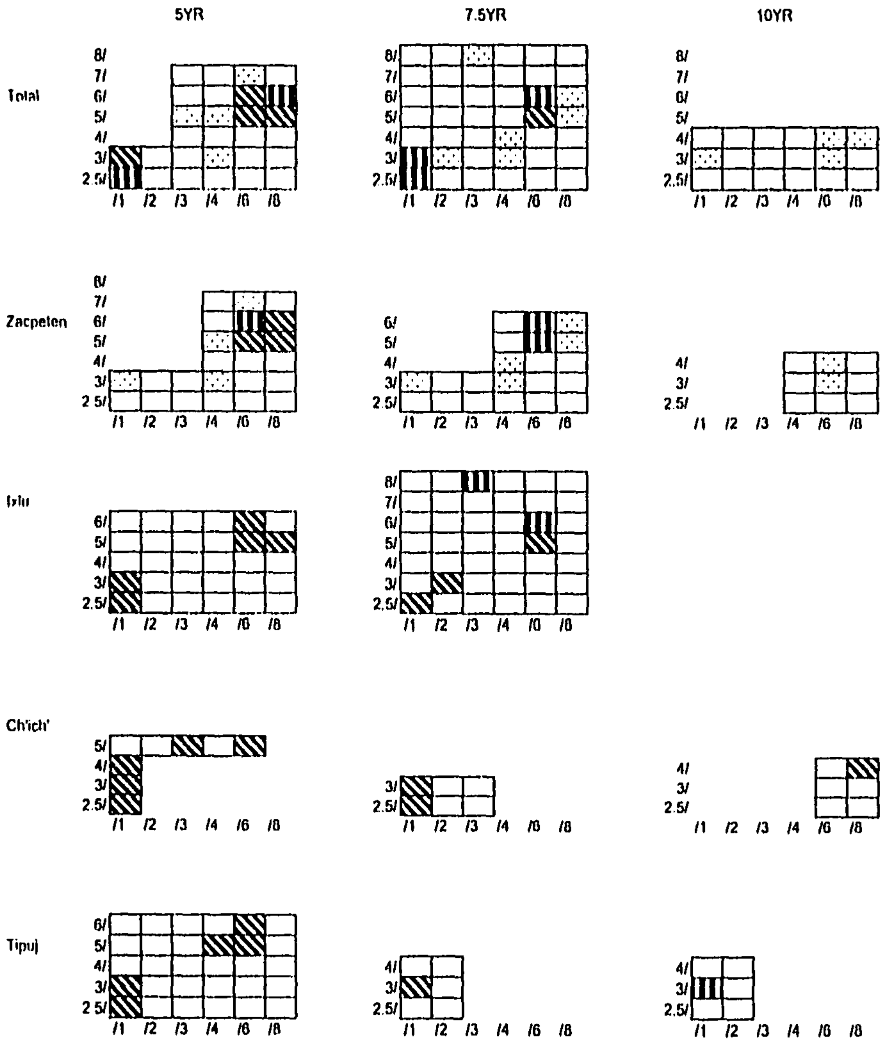


Figure 49: Refired Exterior Slip Color Distribution According to Archaeological Site

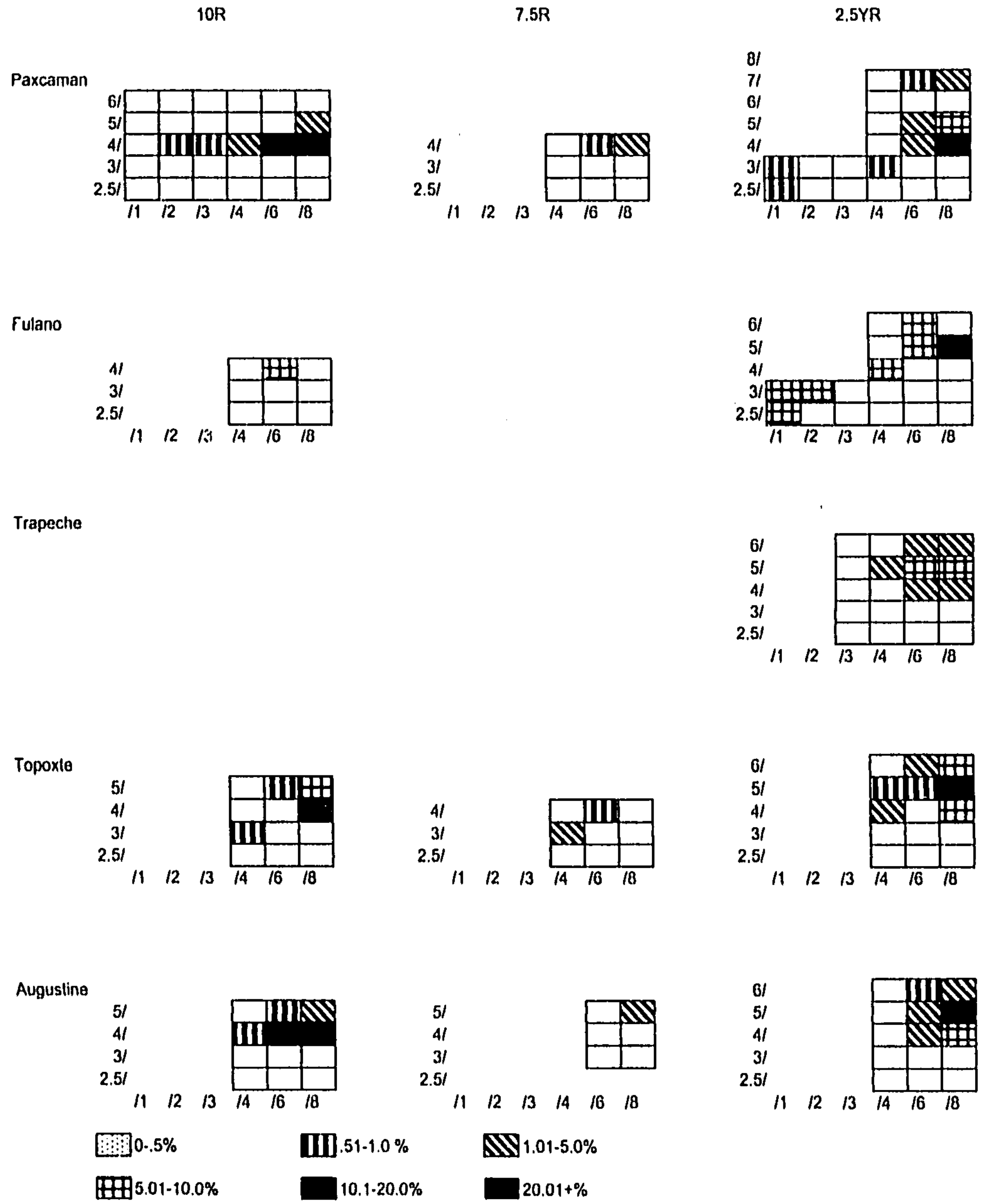


Figure 50: Refired Exterior Slip Color Distribution According to Ceramic Group (continued on next page)

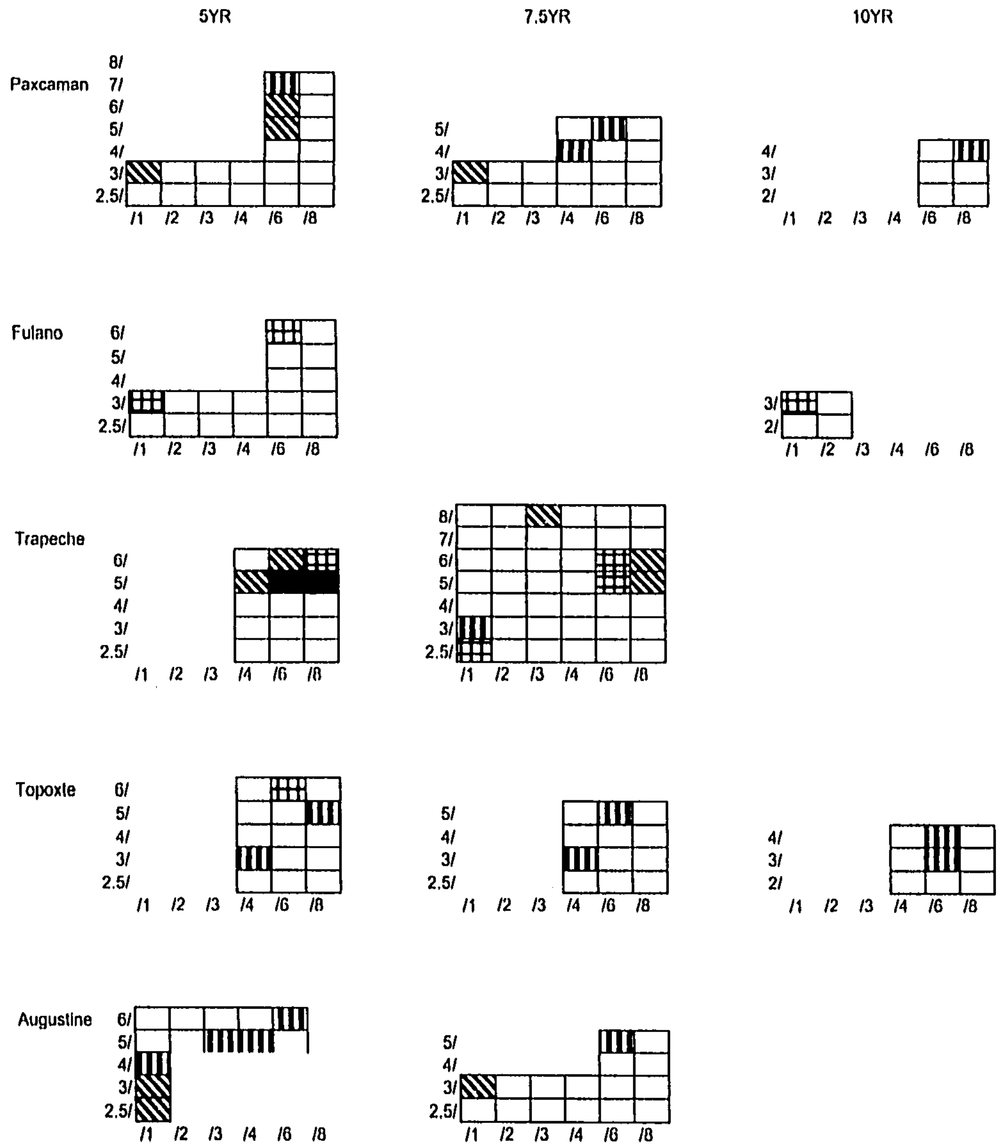


Figure 50: Refired Exterior Slip Color Distribution According to Ceramic Group

Table 22: Color Diversity Measurements for Refired Exterior Slipped Surfaces

	Sample Size	Total Number of Colors Recorded	Number of Colors Consisting of More than 1.0% of the Sample	Richness	Evenness	Heterogeneity
Zacpetén	202	36	12	2.53	.73	.90
Ixlú	106	27	19	2.62	.86	.91
Ch'ich'	69	17	17	3.25	.83	.86
Tipuj	131	18	14	1.57	.73	.88
Paxcamán	176	25	14	1.88	.76	.83
Fulano	14	10	10	2.67	.96	.97
Trapeche	66	19	18	2.34	.90	.92
Topoxté	110	20	9	1.91	.70	.86
Augustine	142	18	12	1.51	.86	.85

a red slip in a reducing environment. The increased richness at Ch'ich' and within the Topoxté ceramic group may suggest a better control over firing technology.

Although evenness measurements of refired slips are on the average higher than those of the original sherds, similar trends occur. The only exception occurs with Tipuj and Paxcamán ceramic group sherds having a lower evenness value than in Table 46, but the value is not significantly lower to warrant further discussion.

On the whole, heterogeneity values are higher with regard to refired slips than those of original exterior slipped surfaces. As suggested above, the high diversity of slipped surfaces indicates a wide variety of slip colors as well as the possibility that Petén Postclassic Maya potters aimed to create "specific" slip colors.

<u>III.D. Refired Hardness</u>

In addition to firing atmosphere, firing temperature, and refired slip color diversity, laboratory refiring experiments allow the archaeologist to test the hardness of the sherd surfaces and cores in order to determine changes in slip and clay properties when fired to 800°C, which in turn may suggest potters' knowledge with regard to clay properties. Tables 23-28 provide measurements of central tendencies of refired interior surfaces, exterior surfaces, and cores with regard to archaeological site and ceramic group.

Tables 23 and 24 provide information concerning interior surfaces. When fired to 800°C, sherds from all sites and ceramic groups increase in hardness (from 2 to3) and the range of hardness increases. The increase of range of variability of interior surfaces

Table 23: Refired Interior Surface Hardness Measurements by Archaeological Site

	Median	Mode	Range (Min.-Max.)
Zacpetén	3	3	1.5-5
Ixlú	3	2, 3	2-4
Ch'ich	3	3	2-5
Tipuj	3	2, 3	2-5

Table 24: Refired Interior Surface Hardness Measurements by Ceramic Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	3	3	2-5
Fulano	3	2, 3	2-5
Trapeche	2.5	2, 3	2-4
Augustine	3	3	2-5
Topoxté	2	2	1.5-4

Table 25: Refired Exterior Surface Hardness Measurements by Archaeological Site

	Median	Mode	Range (Min.-Max.)
Zacpetén	3	3	1.5-5
Ixlú	3	3	2-5
Ch'ich	3	3	2-5
Tipuj	3	2, 3	2-5

Table 26: Refired Exterior Surface Hardness Measurements by Ceramic Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	3	3	2-5
Fulano	3	3	2-5
Trapeche	3	3	2-4
Augustine	3	3	2-5
Topoxté	3	2, 3	1.5-5

Table 27: Refired Core Hardness Measurements by Archaeological Site

	Median	Mode	Range (Min.-Max.)
Zacpetén	3	3	2-5
Ixlú	3	3	2-4
Ch'ich	3	3	2-4
Tipuj	3	3	2-5

Table 28: Refired Core Hardness Measurements by Ceramic Group

	Median	Mode	Range (Min.-Max.)
Paxcamán	3	3	2-5
Fulano	3	3	2-3
Trapeche	3	3	2-3
Topoxté	3	2,3	2-4
Augustine	3	3	2-4

may reflect the variability of the primary slip. Ixlú and Tipuj represent a bimodal distribution and the Fulano and Trapeche ceramic group refired sherds also occur in a bimodal distribution.

Measures of central tendencies of exterior refired surface hardness are presented in Tables 25 and 26. Zacpetén and Ixlú surface medians and modes remain constant while Ch'ich' and Tipuj exterior surfaces increase in hardness. Tipuj's distribution becomes bimodal when sherds are refired to 800°C. In addition to the increase in hardness, the range of hardness values also increases. The Fulano ceramic group is the only ceramic group whose median and mode remain constant. All other ceramic group exterior surfaces increase in hardness and the range of hardness variability also increases.

Core hardness median and mode values remain constant with regard to archaeological site and ceramic group (Tables 27 and 28). However, the Topoxté ceramic group is characterized by a bimodal distribution. With the exception of Ixlú and the Trapeche, Augustine, and Topoxté ceramic groups, ranges of hardness variability also increase.

From the above laboratory refiring experiments, I suggest that the pottery sample for this study reflects a great deal of variability. This variability supports Rice's (1980; 1987a) proposition that Postclassic pottery reflects Maya experimentation with clays, slips, and firing techniques. The experimentation with clays, slips, and firing techniques may result from the restriction of resources due to the enforcement of social boundaries. It may also result from a depletion of resources for firing due to clearing for settlement.

IV. Form Measurements

Measurement-based classifications of Postclassic forms also suggest variability during the Postclassic period in the Petén lakes region. The following discussion is based on measurements of rim diameters of the different Postclassic vessel forms (tripod plates, bowls, grater bowls, collared jars, and narrow neck jars). Descriptive statistics (mean, mode, median, and standard deviation) for each vessel form are grouped according to archaeological site and ceramic group to provide possible differences that may be reflected in the technological styles of Petén Postclassic slipped pottery. Information from Tayasal, Topoxté Island, and Macanché Island are included in this section.

IV.A. Tripod Plates

A total of 223 tripod plate rims from the sherds in the present study were measured and the descriptive statistics appear in Table 29. The total distribution of tripod plate rim diameters results in a unimodal distribution centered at 24 cm with the majority of rim diameters occurring between 20 and 30 cm. Rim diameters from Ixlú and Zacpetén follow the same general trend. On the other hand, Ch'ich' and Tipuj have slightly larger means (approximately 26 cm) and larger rims (36-44 cm). Tipuj has the largest measured tripod plate diameter at 44 cm.

When one examines the tripod plate rims with regard to ceramic group, some differences occur that may reflect differences in time period (i.e., earlier vs. later Postclassic). Rice (1980:73) states that rim diameters decrease from the Terminal Classic

Table 29: Tripod Plate Rim Diameter (cm) Descriptive Statistics

	Number	Mean	Mode	Median	Standard Deviation
Zacpetén	111	23.8	22	24	3.63
Ixlú	30	24.6	24	24	3.41
Ch'ich'	35	26.9	28	28	4.28
Tipuj	47	25.9	26	26	4.05
Paxcamán	136	25.0	24	24	3.83
Fulano	5	21.6	16	22	5.90
Trapeche	12	26.0	28	27	3.81
Augustine	32	26.5	24	26	4.13
Topoxté	39	23.7	26	24	3.08
Total	193	24.0	25	24	7.56

period to the Postclassic period. If the Augustine and Trapeche ceramic groups represent the Early/Middle Postclassic period, their rim diameters should be larger than those of the Paxcamán and Topoxté. The present data set supports this statement. Augustine ceramic group tripod plate rim diameters have a mean of 26.5 cm with a range of 20-44 cm and Trapeche tripod plate diameters have a mean of 26 cm with a range of 20-34 cm. According to Rice (1987a), the Paxcamán ceramic group appears in all Postclassic contexts suggesting that rims should vary when examined as a whole. According to the data for this sample, the Paxcamán tripod dish rim diameter mean is 25.0 cm with a range of 14-38 cm which demonstrates the variability that Rice describes. Finally, Topoxté ceramic group tripod plate rim diameters should be the smallest because Topoxté pottery is largely a Late Postclassic phenomenon. The present Topoxté tripod plate diameter mean is 23.7 cm with a range of 18-28 cm.

Because the Fulano ceramic group is a new Postclassic ceramic group, I am unsure as to its placement in the Postclassic scheme. However, if one follows the above outline of the relationship of ceramic groups, rim diameter means and ranges, and relative time period placement, I place the Fulano ceramic group as a later Postclassic ceramic group. The tripod plate diameter mean is 21.6 cm with a range of 16-30 cm. The range resembles that of the Topoxté ceramic group.

In addition to the present sample, I measured tripod plate rim diameters of all of the tripod plates from Ixlú, Ch'ich', Zacpetén, and Tipuj, as well as Tayasal, Macanché Island, and Topoxté Island. Table 30 presents rim diameter data for all tripod plates from Ch'ich, Ixlú, Zacpetén, and Tipuj. The descriptive statistics suggest that the sample used for this study represents the range of the entire Postclassic tripod plate sample with two minor exceptions. First, differences in rim diameters at Ch'ich' suggest that the sample used in this study represents tripod plates that are four centimeters larger than the average tripod plate at Ch'ich'. Second, the sample of Trapeche ceramic group sherds in this study has larger diameters than the whole sample.

I measured rim tripod plate rim diameters from Tayasal, Macanché Island, and Topoxté Island. Table 31 presents descriptive statistics for tripod plates from Tayasal. When examined as a whole sample, the rim diameters are slightly larger (1.4 cm) than the four sites discussed above. While Augustine and Paxcamán ceramic group tripod dishes from Tayasal are nearly identical to those presented above, Trapeche ceramic group tripod dish diameters are 4.5 cm larger. Although this is a large difference, it may be accounted for by a small sample size (n=4).

Tripod dish diameters from Macanché Island show interesting differences (see Table 32). Total tripod dish rim diameters and Paxcamán and Trapeche ceramic group tripod dish rim diameters are on the average three centimeters smaller than tripod dish rim diameters from all other sites in the Petén lakes region. This difference may indicate a difference between ritual pottery and non-ritual pottery. On the other hand, the two late ceramic groups (Topoxté and Fulano) have similar rim diameters as compared to the other sites in the Petén lakes region. Again, sample size of the Fulano and Topoxté ceramic groups from Macanché Island may influence the data, but it may also suggest that late Postclassic tripod dishes have less variability as to rim diameter.

Table 30: All Postclassic Tripod Plate Rim Diameter (cm) Descriptive Statistics

	Number	Mean	Mode	Median	Standard Deviation
Zacpetén	180	24.1	24	24	2.91
Ixlú	107	24.6	24	26	2.55
Ch'ich'	22	24.8	24	24	2.58
Tipuj	22	26.0	28	28	4.14
Paxcamán	253	24.6	24	24	3.01
Fulano	0	0	0	0	0
Trapeche	5	24.0	24	24	1.41
Augustine	15	26.3	28	28	2.81
Topoxté	58	23.6	24	24	2.48
Total	331	24.5	24	24	2.94

Table 31: Tayasal Tripod Plate Rim Diameter Descriptive (cm) Statistics

	Number	Mean	Mode	Median	Standard Deviation
Paxcamán	13	24.9	24	24	2.51
Trapeche	4	28.5	28	28	2.52
Augustine	11	26.1	26	26	2.30
Total	27	25.9	26	24	2.70

Table 32: Macanché Island Tripod Plate Rim Diameter (cm) Descriptive Statistics

	Number	Mean	Mode	Median	Standard Deviation
Paxcamán	38	21.8	22	22	2.52
Trapeche	67	21.4	22	22	2.41
Fulano	6	20.8	22.5	24	4.58
Topoxté	10	23.8	24	24	2.74
Total	121	21.7	22	22	2.66

Tripod dish diameters from Topoxté Island resemble those at other sites in the Petén lakes region (see Table 33). This is not surprising since Topoxté pottery is believed to have been made at the Topoxté Islands and traded to other sites (Rice 1986:278).

IV.B Bowls

I measured 20 bowl rim diameters and the corresponding descriptive statistics appear in Table 34. Bowl rim diameters form an unimodal distribution with a mean of 20.3 cm and a range of 9-40 cm. Bowls from Ixlú are smaller than bowls from the other three sites with a mean of 14 cm and a range of 10 to 18 cm. On the other hand, Ch'ich' has the largest bowl rim diameter mean at 26 cm with a range of 16-36 cm. Tipuj and Zacpetén have similar means, but Zacpetén has the largest bowl rim diameters in the collection.

Trapeche ceramic group bowls have the smallest diameters with a mean of 12 cm and a range of 10-14 cm. The remaining three ceramic groups (there are no Fulano bowls in the sample) have similar means (20-22 cm) and ranges; however, the Paxcamán ceramic group has the widest range of rim diameters (9-40 cm). The differences in bowl rim diameter means with regard to ceramic groups does not correspond to the potential chronological differences present in tripod plate rim diameters, but this may be the result of a smaller sample size.

Table 33: Topoxté Island Tripod Plate Rim Diameter (cm) Descriptive Statistics

	Number	Mean	Mode	Median	Standard Deviation
Topoxté	12	24.9	24	24	2.31

Table 34: Bowl Rim Diameter Descriptive Statistics

	Number	Mean	Mode	Median	Standard Deviation
Zacpetén	9	22.2	20	20	9.13
Ixlú	4	14.0	14	14	3.24
Ch'ich'	2	26.0	NA	26	14.14
Tipuj	5	19.6	22	22	6.19
Paxcamán	8	20.6	NA	17	11.55
Fulano	0	0	0	0	0
Trapeche	2	12.0	NA	12	2.83
Augustine	6	21.5	20	22	5.58
Topoxté	4	22.0	NA	21	4.32
Total	20	20.3	20	20	8.31

IV.C. Grater Bowls

Table 35 provides the descriptive statistical information for the eight grater bowls rim diameters in the present sample. When one examines all grater bowls, a bimodal distribution (22 cm and 26 cm) occurs, with a mean of 25 cm and a range of 22-28 cm. Grater bowls from Ixlú have the smallest mean (24 cm) and the widest range of diameters (22-28 cm). Ch'ich' grater bowls occur with diameters of 22 cm and 28 cm. The grater bowl from Tipuj has a rim diameter of 26 cm and the grater bowl from Zacpetén has a diameter of 28 cm.

Grater bowls only occur in the Paxcamán and Augustine ceramic groups. Most Petén Postclassic grater bowls have the snail inclusion paste typical of the Paxcamán ceramic group and have a similar hardness as other vessels forms. The Augustine grater bowl has a rim diameter of 28 cm. On the other hand, grater bowls of the Paxcamán ceramic group have a mean of 24.6 cm and a range of 22 cm to 28 cm.

IV.D. Collared Jars

Collared jars typically have larger rim diameters than tripod plates and narrow neck jars (Table 36). The total collared jar rim diameter mean is 26.0 cm with a range of 6-40 cm. The sample is unimodal with a negative kurtosis centered at 32 cm. Collared jars from Tipuj have the largest rim diameters, the second largest mean, and the widest range of rim diameters (6-40 cm). Tipuj's distribution resembles that of all of the diameters having the smallest range (28-30 cm) and the largest mean. Augustine ceramic group collared jars demonstrate a bimodal distribution centered at 28 cm and 34 cm.

Table 35: Grater Bowl Rim Diameter Statistics

	Number	Mean	Mode	Median	Standard Deviation
Zacpetén	1	28.0	NA	28	NA
Ixlú	4	24.0	22	22	2.83
Ch'ich'	2	25.0	NA	25	4.24
Tipuj	1	26.0	NA	26	NA
Paxcamán	7	24.6	22	24	2.76
Fulano	0	0	0	0	0
Trapeche	0	0	0	0	0
Augustine	1	28.0	NA	28	NA
Topoxté	0	0	0	0	0
Total	8	25.0	22	25	2.83

Table 36: Collared Jar Rim Diameter Statistics

	Number	Mean	Mode	Median	Standard Deviation
Zacpetén	20	25.2	28	27	6.94
Ixlú	5	23.6	32	30	3.05
Ch'ich'	3	29.3	NA	30	3.05
Tipuj	22	26.8	32	27	7.82
Paxcamán	14	23.3	32	25	9.00
Fulano	1	32	NA	32	NA
Trapeche	4	30.5	32	31	1.91
Augustine	22	27.1	28	28	5.33
Topoxté	9	24.7	26	26	10.39
Total	50	26.0	32	28	7.54

Topoxté and Paxcamán group collared jars have the smallest rim diameter means but the largest ranges. Topoxté ceramic group collared jar rim diameters range from 6-40 cm and Paxcamán ceramic group collared jar rim diameters range from 6-32 cm. The Paxcamán ceramic group distribution is bimodal and centered at 16 cm and 32 cm.

Collared jars occur in all five Postclassic ceramic groups. Fulano, Trapeche, and Augustine ceramic group collared jars have the largest rim diameter means. Ch'ich' collared jars have the largest rim diameter mean (29.3 cm) with rim diameters of 30 cm and 32 cm. On the other hand, Ixlú collared jars have the smallest rim diameter mean (23.6 cm) with rim diameters of 8 cm, 16 cm, and 32 cm. Zacpetén has the highest frequency of collared jars and has a bimodal distribution at 20 cm and 28 cm.

IV.E. Narrow Neck Jars

I measured 54 narrow neck jar rim diameters and the descriptive statistics are presented in Table 37. The overall rim diameter mean is 20.5 cm with a bimodal distribution centered at 20 cm and 30 cm. Zacpetén has the smallest narrow neck jar rim diameters with a mean of 18.8 cm and a range of 8 cm to 32 cm. Ixlú and Tipuj narrow neck jars have similar means (20.6 cm and 20.8 cm, respectively) with similar ranges (6-38 cm and 8-34 cm, respectively). Tipuj's narrow neck jar distribution is also bimodal with centers at 24 cm and 32 cm. Ch'ich' narrow neck jar rim diameters have the largest mean of 26 cm with a range of 20 cm to 36 cm.

Trapeche and Fulano ceramic group narrow neck jars have the smallest means (16.67 cm and 18 cm, respectively). While most of the Trapeche ceramic group narrow

Table 37: Narrow Neck Jar Rim Diameter Statistics

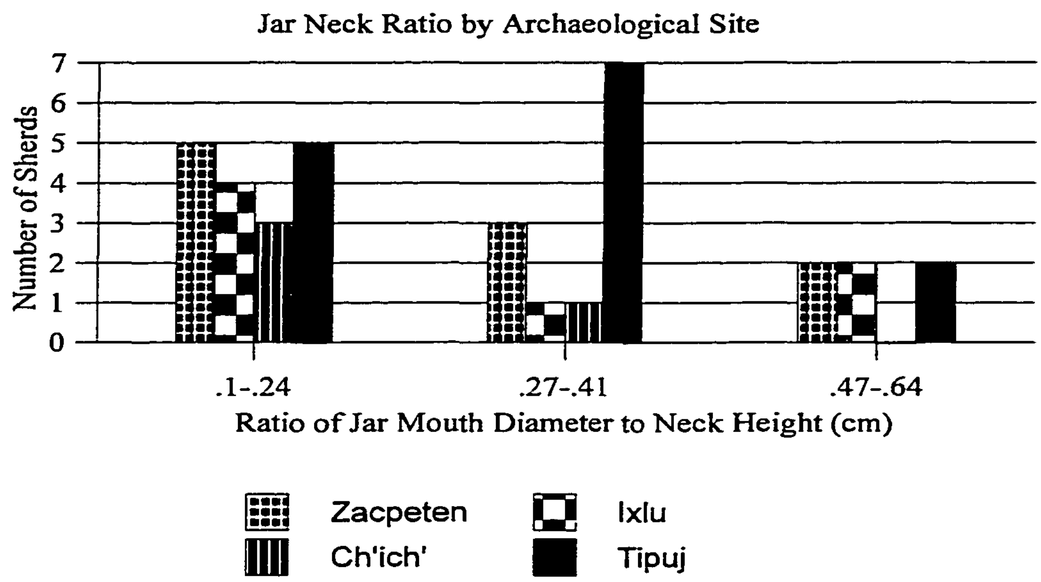
	Number	Mean	Mode	Median	Standard Deviation
Zacpetén	12	18.8	14	17	16.79
Ixlú	7	20.6	14	20	9.64
Ch'ich'	4	26.0	14	14	7.12
Tipuj	30	20.8	24	20	7.22
Paxcamán	16	21.7	10	21	8.40
Fulano	3	18.0	14	14	6.93
Trapeche	6	16.7	12	14	7.66
Augustine	18	21.0	24	20	6.62
Topoxté	11	20.6	20	20	8.44
Total	54	20.5	20	20	7.57

neck jars have rim diameters between 12 cm and 16 cm, one rim has a diameter of 32 cm. Fulano ceramic group narrow neck jar diameters are 14 cm and 32 cm. Paxcamán, Topoxté, and Augustine ceramic group narrow neck jars have similar rim diameters (20-21 cm). Paxcamán and Augustine ceramic group narrow neck jar diameters have the largest range. The Topoxté ceramic group has a bimodal distribution centered at 20 cm and 32 cm.

Neck height measurements may provide information as to functional categories. Jars with wide mouths may be cooking or storage jars whereas jars with tall restricted necks may have been used as jars to hold liquids (Rice 1987b:239-240). Of the 54 narrow neck jar rims, 37 have complete necks. When the jar rim diameters are compared to neck heights, the resulting ratios provide categories such as low neck, medium neck, and high neck jars that may represent the above functions.

For this sample of 37 jar neck to height ratios, three groups exist. Low neck jars are those that have ratios between .10 and .24, medium neck jars have ratios between .27 and .41, and high neck jars have ratios between .47 and .64. Figure 51 provides the graphic distribution of the data.

From these data according to archaeological site and ceramic group, some interesting differences appear. First, Zacpetén, Ixlú, and Tipuj jar necks vary from short to tall whereas Ch'ich' jars are characterized by short and medium neck heights. This may be a result of limited excavations at Ch'ich'. Second, Paxcamán and Augustine ceramic group jar neck heights vary while Trapeche and Topoxté ceramic group jars tend to have medium to tall neck heights. Overall differences in rim diameters and neck



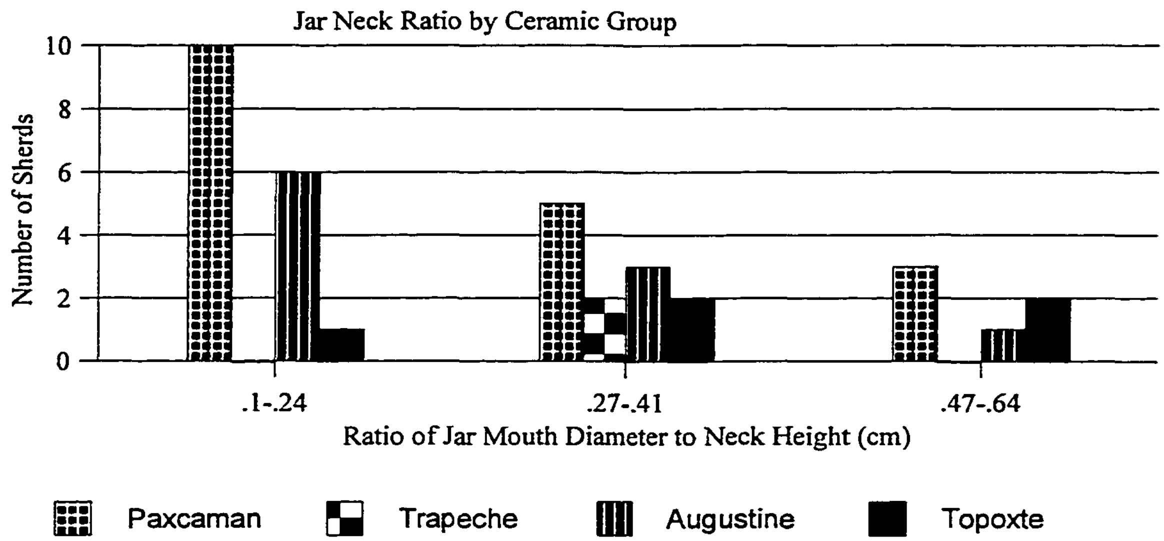


Figure 57: Narrow Neck Jar Ratios by Archaeological Site (top) and by Ceramic Group (bottom).