Taphonomy and Subsistence Strategies at Ndondondwane, a zooarchaeological perspective on an Early Iron Age Homestead in the Thukela Valley, Republic of South Africa

By

Edward R. Fread

A thesis submitted to the Faculty of Graduate Studies
in partial fulfillment of the requirements of the degree of

MASTER OF ARTS

Department of Anthropology

University of Manitoba

Winnipeg, Manitoba

-

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION

Taphonomy and Subsistence Strategies at Ndondondwane, a zooarchaeological Perspective on an Early Iron Age Homestead in the Thukela Valley, Republic of South Africa

BY

Edward R. Fread

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

MASTER OF ARTS

Abstract

This research examined the subsistence strategies of an Early Iron Age homestead named Ndondondwane, through the analysis of one of the largest zooarchaeological assemblages in southeastern Africa. Ndondondwane consisted of a homestead site occupied for a maximum of 50 years, radiocarbon dated to c. 750 AD (uncalibrated) and located in the lower Thukela River valley, KwaZulu-Natal, Republic of South Africa. Four temporal sub-fields were identified that signified (1) initial occupation, (2) homestead and population expansion, (3a) abandonment and (3b) post abandonment re-utilization. The zooarchaeological assemblage consisted of over 50,000 fragments with a NISP of 47,048 from which 39.3% were identifiable. Domesticates represented the focus of exploitation for Ndondondwane, while wild species supplemented the diet. Harvest profile analysis determined that *Ovis aries* were utilized primarily for meat, *Capra hircus* for milk and *Bos taurus* for both milk and meat. The abundance and unusual nature of the artifactual remains at Ndondondwane (ceramic masks, figurines, ivory fragments and bangles) indicate the presence of a settlement hierarchy whereby Ndondondwane may have been a chiefdom homestead.

Acknowledgements

This thesis signifies the culmination of years of research and analysis on Early Iron Age subsistence strategies in southeastern Africa. Yet, it would not have been possible without the help and support of so many people.

A special thank-you must be given to my thesis advisory committee: Professors Dr. Haskel Greenfield, Dr. Brian Schwimmer and Dr. Kevin Campbell for showing great patience, understanding and wisdom throughout this learning process. In particular, Dr. Greenfield spent an inordinate amount of time helping me make sense out of the massive data-set. I appreciate all of the long, late evenings spent with me that took you away from your own research and family. Thanks. I also have to thank- Dr. Karen Jensen for believing in me and showing a willingness to see my work through to the end.

The zooarchaeological analysis was not accomplished by just myself. Liz Voigt and Angela von den Driesch identified the 1978 assemblage. Liz Voigt, James Brink and Shaw Badenhorst provided their extensive zooarchaeological skills to help identifying the wild fauna at Ndondondwane. The 1982-83 and 1995-1997 fauna were analyzed for the most part by Haskel Greenfield, Tina Jongsma and myself, along with assistance from Liz Arnold, Darryl deRuiter, Matt Singer, Michelle Perles, Claire Pfeiffer and Kerri Hargrave. Each has contributed towards the creation of one of the largest EIA zooarchaeological assemblages in southeastern Africa. Haskel and his team were unstinting in providing access to all of their data from the site for use in this thesis. Permission to reproduce photographs, maps and figures from the Ndondondwane archives was obtained from Dr. Greenfield for this thesis.

I am indebted to Len van Schalkwyk for sharing his wealth of knowledge, great wit and love of archaeology and the outdoors that made my experiences in South Africa most memorable. Len also demonstrated South African hospitality at its finest by treating me like family, hosting numerous and unforgettable *braais* and creating excursions to break up the intensity of fieldwork.

Recognition must also be given to my fieldwork compatriot Kent Fowler whose enthusiasm and focus was infectious and greatly appreciated. It was an enjoyment working closely with such a talented scholar. A thank-you must also be extended to Gavin Whitelaw, who demonstrated South African hospitality by giving me access into his home, family and knowledge-base without any reservations.

Thanks must also be extended to Virginia Petch and the staff at Northern Lights Heritage Services Inc. for their patience and adaptability during scheduling changes and project juggling due to my writing requirements. Their support during those times has meant a lot to me.

Last, but not least, I want to thank my wife Sandy, who stood by me and believed in me during the most difficult times. This thesis is in a large part because of your belief in me.

Table of Contents

Abstract i

Acknowledgements ii

Table of Contents iv

List of Figures xvi

List of Tables xviii

Chapter 1: Introduction to Thesis 24

I. Theoretical Background to the Research Problem 24

II. Research Goals and Hypotheses 27

A. Major Research Questions 27

B. Major Hypotheses 28

III. Method 29

A. Method 30

B. Technique 30

C. Technology 31

IV. Data - Background to study site 32

A. Time period 33

B. Region 34

C. Site 34

D. Data – the fauna 36

V. Conclusion 37

VI. Thesis Structure 37

Chapter 2: Culture history of the Early Iron Age in Southern Africa 40

I. Introduction 40

II. Culture history of southeastern Africa 40

A. Arrival and beginning of the Early Iron Age into South Africa 40

B. The Initial Early Iron Age 42

C. The later and developed Early Iron Age 45

1. The Msuluzi tradition 49

2. The Ndondondwane tradition 50

3. The Ntshekane tradition 51

III. Early Iron Age subsistence 52

A. Botanical 53

B. Zoological 54

1. KwaGandaganda 55

2. Wosi 56

3. Mamba 57

IV. Conclusion 59

A. Summary 59

B. Significance (Discussion) 60

Chapter 3: Ethnographic herding patterns in Eastern and Southern Africa 62

I. Introduction 62

II. Modes of production among pastoral and agro-pastoral societies in south and east Africa 63

A. Pastoralists 64

B. Agro-Pastoralists (mixed farming) ... 66

III. Cultural significance of domesticates ... 66

A. Cattle ... 66

B. Caprines (Sheep and Goats) ... 69

C. Sheep ... 70

D. Goats ... 70

IV. Primary and secondary animal products exploited by herders ... 71

A. Use of primary products by herders ... 71

1. Primary products - meat ... 71

2. Primary products - hides ... 72

3. Primary products – bone and sinew ... 73

4. Primary products – marrow ... 73

5. Primary products - other ... 74

B. Use of secondary products by herders ... 74

1. Secondary products - milk ... 75

2. Secondary products – wool ... 75

3. Secondary products - blood ... 76

4. Secondary products – dung ... 76

5. Secondary products – transportation ... 76

V. Culling patterns ... 76

VI. Herd maintenance ... 78

VII. Conclusion ... 80

Chapter 4: The Study Area and Site - Ndondondwane ... 83

I. The study area: region 83

II. The Site: Ndondondwane 86

A. Chronology 87

B. Modern intrusion 88

III. Previous research and excavations at Ndondondwane 88

A. Tim Maggs, 1978 89

1. The Mound Area 90

B. Jannie Loubser, 1982-1983 92

1. The Mound Area 93

2. The Dung Area 95

3. The Daga Area 97

4. Significance 97

VI. Haskel Greenfield and Leonard van Schalkwyk Collaboration, 1995-1998 99

1. The Dung Area 102

2. Transect 1 102

3. Charcoal Preparation Area 104

4. Midden 1 105

5. Midden 2 (The Daga Area) 107

6. Midden 3 108

7. Significance 108

VII. Temporal Placement of Activities 110

A. Lower Horizon 110

B. Middle Horizon 110

C. Upper Horizon 111

D. Summary 111

VIII. Conclusion 112

Chapter 5: Methods 114

I. Introduction: Method and Materials 114

II. Zooarchaeological techniques 115

A. Analysts and the location of research materials 116

B. Bone identification 116

C. Types of laboratory analysis 118

1. Measurement 118

2. Data entry 118

3. Analytical categories 119

a. Species identification 119

b. Age determination 119

c. Sex Determination 120

d. Weathering and other taphonomic influences 121

e. Burning and butchering 121

D. Interpretation of the analyzed data 121

1. Quantification applications 122

a. Number of identified specimens (NISP) 122

b. Minimum Number of Individuals (MNI) 123

c. Relative Frequency (RF) 123

d. Taxonomic diversity 124
III. Influences that may affect zooarchaeological analyses 125
A. Problems of sample size in conjunction with sampling biases 125
b. Bone preservation and taphonomic processes 129
IV. Specific analytical techniques to answer research questions 131
A. Research question 1. 131
B. Research question 2. 132
C. Research question 3. 134
D. Research question 4. 134
V. How does this analysis differ from that previously conducted on the zooarchaeological assemblage at Ndondondwane (Voigt and von den Driesch 1984) .. 135
A. Excavation locations 135
B. Techniques of zooarchaeological analysis 135
VI. Summary and conclusion 137
Chapter 6: Zooarchaeological Data Description 139
I. Introduction 139
II. Quantity of zooarchaeological remains from Ndondondwane 139
III. Levels of identification 140
IV. Spatial distribution of zooarchaeological remains 141
V. Temporal sequence 141
VI. Cultural horizon by area 143
VII. Species representation at Ndondondwane 143
A. Domestic versus wild taxa 144

B. Domestic taxa 144

1. Domestics 144

2. Domestic distribution by secured horizon 145

3. Domestic distribution by area and secured horizon 145

a. Dung Area 146

b. Mound Area 147

c. Transect 1 148

d. Transect 2 148

e. Midden 1 149

f. Midden 2 149

g. Midden 3 150

C. Wild 150

1. Wild distribution by secured horizon 150

2. Wild distribution by area and secured horizon 151

a. Dung Area 151

b. Mound Area 153

c. Transect 1 155

d. Transect 2 155

e. Midden 1 156

f. Midden 2 157

g. Midden 3 157

VIII. Skeletal element representation 157

A. Domestics 158

1. Cattle (*Bos taurus*) 158

2. Sheep (*Ovis aries*) 158

3. Goat (Capra hircus) 159

4. Sheep/Goat (*Ovis/Capra*) 160

5. Dog (Canis familiaris) 161

B. Wild species 162

1. Hippopotamus (Hippopotamus amphibius) 162

2. African Elephant (Loxodonta africanus) 163

3. Common Duiker (*Sylvicapra grimmia*) 163

4. Bovid Classes 164

a. Bovid Class 1 164

b. Bovid Class 2 165

c. Bovid Class 3 165

d. Bovid Class 4 166

IX. Osteometrics 166

X. Harvest profiles (age at death) 167

A. Domestics 167

1. Cattle 168

2. Goats 169

3. Sheep 169

4. Sheep/Goats 170

B. Wild 171

XI. Sexing 171

XII. Taphonomy 172

A. Pre-depositional activities 172

1. Butchering 172

B. Post-depositional activities 173

1. Burning 173

2. Weathering 174

3. Carnivore and rodent gnawing 174

4. Fragmentation 175

a. Fragmentation by activity area 175

b. Fragmentation by horizon 176

XIII. Cultural modification of bone, shell and ivory 176

XIV. Conclusion 177

Chapter 7: Analysis of Data from Ndondondwane 179

I. Introduction 179

II. Qualification of research questions 179

A. Research question 1: Was the community of Ndondondwane more reliant on domesticated animals or were wild animals the primary protein source? 180

B. Research question 2: a) If domestic animals were the primary source of meat, was subsistence specialized or generalized? 182

b) Domestic animals were exploited for which products (primary: meat, bone, and/or secondary: milk, wool)? 183

1. Cattle 185

2. Goats 186

3. Sheep 186

4. Sheep/Goat 187

c) Did the occupants of Ndondondwane rely most on primary or secondary products from their domestic herd? 187

C. Research question 3: 190

a) Did the occupants of Ndondondwane pursue a mixed hunting and fishing strategy among the wild animals that was a reflection on the diverse availability of the fauna in the wild? 190

b) In terms of the wild taxa, was the occupant's economy driven by a culturally selective strategy? 191

D. Research question 4: Is there a discernable differentiation of dietary patterns between the main chronological horizons at Ndondondwane? 192

1. Harvest profiles 193

2. Domestic population growth 193

3. Presence of wild fauna 194

4. Presence of ivory 195

III. Taphonomy 196

A. Conditions of preservation 196

B. Butchering 197

C. Burning 198

D. Weathering 198

E. Gnawing 199

F. Fragmentation 199

G. Modified bone and shell 201

IV. Conclusion 202

Chapter 8: Conclusions 205

I. Introduction 205

II. Results of zooarchaeological analysis 206

A. Quantification as well as temporal and spatial distribution 206

B. Wild species representation 207

C. Domestic species representation 208

III. Archaeological Record Comparison 209

A. KwaGandaganda 209

1. Location and time period 209

2. Recovery and species representation 210

3. Harvest profiles 210

4. Ivory and bone tools 210

5. Summary 210

B. Wosi 211

1. Location and time period 211

2. Recovery and species representation 212

3. Harvest profiles 212

4. Ivory and bone tools 212

5. Summary 212

C. Mamba 213

1. Location and time period 213

2. Recovery and species representation 213

3. Harvest profiles 214

4. Ivory and bone tools 214

5. Summary 214

D. Comparison of results to independent research by Liz Arnold (2006) 214

E. Conclusion of comparisons with other sites 215

IV. Significance of Ndondondwane 216

A. Ivory 216

B. Harvest profiles 217

C. Ritual and ceremonial 217

D. Public recognition of the importance of Ndondondwane 218

V. Conclusions 219

Thesis Bibliography 221

Figures 234

Tables 250

List of Figures

Figure 1 Map of southern Africa (Ndondondwane as red star). 234

Figure 2. KwaZulu-Natal Province with Thukela River and Ndondondwane.... 235

Figure 3 Topographical map of the Thukela River and Ndondondwane. (Courtesy of H. Greenfield) 236

Figure 4. Map demonstrating migrations into southern Africa. 237

Figure 5 Stylistic differences of EIA pottery. 1) Matola; 2) Msuluzi; 3) Ntshekane; and 4) Ndondondwane (Maggs 1984a). 238

Figure 6 Profile of Mound Area cross-sectioned from C10 to I10 (Maggs 1984a). 239

Figure 7 Sketches of typical Ndondondwane Pottery found on Site (Maggs 1984a) 240

Figure 8 Sketch of ceramic mask fragments from the Mound Area (left), ... 240

Figure 9 Excavation Plan of Mound Area by Loubser, including features in the lowest horizon (Loubser 1993) 241

Figure 10. Solid clay figurines exhibiting stylized breasts, buttocks and incised or impressed lines recovered from Ndondondwane. 242

Figure 11 1995 Site plan of Ndondondwane showing excavation and surface scrape and collection areas (Courtesy of H. Greenfield) 243

Figure 12. Photo of burnt daga hut floor (top) and sketch of floor (bottom) from Transect 1. (Courtesy of H. Greenfield).. 244

Figure 13. Sketch of profile of Pit 3 (top) and photo of articulated infant burial in pot from Pit 3 (bottom). (Courtesy of H. Greenfield) 245

Figure 14. Excavation feature plan for Midden 1. (Greenfield et al. 2003) 246

Figure 15. Photo of excavation at Midden 3 (Ivory Midden) with Thukela River in background (Photo © E. Fread). 246

Figure 16 Profile of cross-site stratigraphy (secured horizons) of Ndondondwane 247

Figure 17. Harvest profile of domestic species in Lower Horizon 248

List of Tables

Table 1. Total NISP of Ndondondwane by area..250

Table 2. Total number of fragments to NISP by site area.........................250

Table 3. Quantification of zooarchaeological assemblage by water displacement (ml). 250

Table 4. Frequency of identifiable and unidentifiable (in bold) bone fragments by element type..251

Table 5. Identifiable and unidentifiable (in bold) bone fragments by element type in Dung Area. 252

Table 6. Identifiable and unidentifiable (in bold) bone fragments by element type in Mound Area...253

Table 7. Identifiable and unidentifiable (in bold) bone fragments by element type in Midden 1. 255

Table 8. Identifiable and unidentifiable (in bold) bone fragments by element type in Midden 2. 256

Table 9. Identifiable and unidentifiable (in bold) bone fragments by element type in Midden 3. 257

Table 10. Identifiable and unidentifiable (in bold) bone fragments by element type in Transect 1..258

Table 11. Identifiable and unidentifiable (in bold) bone fragments by element type in Transect 2..259

Table 12. Identifiable and unidentifiable (in bold) bone fragments by element type on the Surface. 259
Table 13. NISP frequency by secure horizon. 260
Table 14. NISP by secure horizon in Dung Area 260
Table 15. NISP by secure horizon in Mound Area. 260
Table 16. NISP by secure horizon in Midden 1. 260
Table 17. NISP by secure horizon in Midden 2. 261
Table 18. NISP by secure horizon in Midden 3. 261
Table 19. NISP by secure horizon in Transect 1 261
Table 20. NISP by secure horizon in Transect 2 261
Table 21. List of all identified species at Ndondondwane. 262
Table 22. Complete species list for Ndondondwane. 266
Table 23. Frequency of mammalian species at Ndondondwane 271
Table 24. Frequency of bird species at Ndondondwane 273
Table 25. Frequency of mollusc species at Ndondondwane. 274
Table 26. Frequency of fish species at Ndondondwane. 274
Table 27. Frequency of reptile species at Ndondondwane. 275
Table 28. Frequency of amphibian and amphibian/reptile species at Ndondondwane. 275
Table 29. Frequency of domestic versus wild species at Ndondondwane. 276
Table 30a. Frequency of domestic species by area. 280

Table 31. Frequency of domestic species by secure horizon in Dung Area. 283

Table 32. Frequency of domestic species by secure horizon in Mound Area. 284

Table 33. Frequency of domestic species by secure horizon in Midden 1. 284

Table 34. Frequency of domestic species by secure horizon in Midden 2. 285

Table 35. Frequency of domestic species by secure horizon in Midden 3. 285

Table 36. Frequency of domesticated species by secure horizon in Transect 1 286

Table 37. Frequency of domesticated species by secure horizon in Transect 2. 286

Table 38. Frequency of wild species at Ndondondwane by area. 287

Table 39. Frequency of wild fauna at Ndondondwane by secure horizon. 294

Table 40. Frequency of wild class by secure horizon 301

Table 41. Frequency of wild species by secure horizon for Dung Area. . 302

Table 42. Frequency of wild species by secure horizon in Mound Area. 304

Table 43. Frequency of wild species by secure horizon in Midden 1. 308

Table 44. Frequency of wild species by secure horizon in Midden 2. 309

Table 45. Frequency of wild species by secure horizon in Midden 3. 310

Table 46. Frequency of wild species by secure horizon in Transect 1....311

Table 47. Frequency of wild species by secure horizon in Transect 2....311

Table 48. Bos taurus element frequency by area and secure horizon....312

Table 49. Frequency of cattle elements by area....319

Table 50. Frequency of sheep elements by area....323

Table 51. Frequency of sheep elements by pan site secure horizon.....324

Table 52. Frequency of goat elements by area....326

Table 53. Goat element frequency by pan site secure horizon.....328

Table 54. Sheep/Goat element frequency by area....330

Table 55. Sheep/Goat element frequency by secure horizon....332

Table 56. Domestic dog element frequency by area....334

Table 57. Domestic dog element frequency by pan site secure horizon. 335

Table 58. Hippopotamus amphibius element frequency by area.....336

Table 59. *Hippopotamus amphibius* element frequency by pan site secure horizon....338

Table 60. Elephant element frequency by area....339

Table 61. Elephant element frequency by pan site secure horizon.....339

Table 62. Common duiker element frequency by area.....340

Table 63. Common duiker element frequency by pan site secure horizon. 341

Table 64. Bovid Class 1 element frequency by area....342

Table 65. Bovid Class 1 element frequency by pan site secure horizon..344

Table 66. Bovid Class 2 element frequency by area.....345

Table 67. Bovid Class 2 element frequency by pan site secure horizon. . 347

Table 68. Bovid Class 3 element frequency by area. 349

Table 69. Bovid Class 3 element frequency by pan site secure horizon. . 351

Table 70. Bovid Class 4 element frequency by area. 353

Table 71. Bovid Class 4 element frequency by pan site secure horizon. . 354

Table 72. List of all species and elements measured from the 1982-1983 and 1995-1997 archaeological campaigns at Ndondondwane 355

Table 73. Harvest profile for domestic species at Ndondondwane. 358

Table 74. Harvest profile for domestic species by Lower and Middle Horizons. 360

Table 75. Harvest profile of domestic species for lower and middle horizons without subadult/adult age group. 361

Table 76. Harvest profile of cattle by area 363

Table 77. Harvest profile for goats by area. 363

Table 78. Harvest profile for sheep by area. 364

Table 79. Harvest profile for sheep/goats by area. 364

Table 80. Frequency of sexing by species at Ndondondwane. 367

Table 81. Frequency of butchering by area. 368

Table 82. Butchering frequency by secure horizon. 374

Table 84 cont. Burning by area. 391

Table 85. Levels of burning by secure horizon. 395

Table 86. Weathering frequency by area. 395

Table 87. Weathering levels by secure horizon. 396

Table 88. Frequency and type of gnawing present at Ndondondwane by area..........396
Table 89. Frequency and type of gnawing by species..........397
Table 90. Frequency and type of gnawing by species..........402
Table 91. Frequency of level of fragmentation by element size and site area..........407
Table 92 cont. Frequency of level of fragmentation by element size and site area..........407
Table 93. Frequency of fragmentation by fragment size and secure horizon..........408
Table 94. Frequency of bone tools and adornment at Ndondondwane..........409
Table 95. Frequency of tool and adornment type by area..........410
Table 96. Frequency of polish by level and area..........411

Chapter 1: Introduction to Thesis

I. Theoretical Background to the Research Problem

Subsistence strategies are economic and ecological activities through which a group of individuals continuously procure a diversity of nutrients, while ensuring that the energy costs of obtaining them do not exceed the benefits that they produce (Reitz and Wing 1999; Schmitt and Lupo 1995). Most archaeological analyses view hunter-gatherer subsistence strategies in ecological terms. Archaeologists view subsistence from the basic perspective of humans as predators, whether they are hunter-gatherers, horticulturists, agriculturists or pastoralists (Reitz and Wing 1999: 239-240). In contrast, the subsistence practices of food producing societies are viewed in economic terms. This difference is particularly cogent with respect to this investigation.

This thesis will examine the subsistence practices of one of the early food producing cultures in southern Africa through the zooarchaeological remains found at the Early Iron Age (EIA) site of Ndondondwane (KwaZulu-Natal). The examination of the economic activities and dietary patterns of a culture group essentially creates the opportunity to better understand many aspects of that group's existence. Knowing what people ate assists us in recognizing and understanding other characteristics of their life and culture. Zooarchaeologists study animal remains from archaeological sites in order to reconstruct, among many things, subsistence strategies. The accumulation of animal skeletal remains that make up an assemblage provides the body of evidence that allows the zooarchaeologist to determine the dietary choices, settlement patterns, technological abilities, and social organizations of past populations (Cable 1984; Reitz and Wing 1999; Voigt 1983).

Although it is through zooarchaeological analysis that subsistence strategy can be comprehended in an archaeological context, it must be remembered that the conscious choices by a group is the driving force that determines how a resource is to be utilized (Teeter and Chase 2004: 155-156). Therefore, culture is the motivating force that determines subsistence strategy, which in turn is assessed through zooarchaeological analysis. Until recently, zooarchaeological analyses of sites were merely expected to produce report appendices containing basic species lists and rough frequencies of numbers present (Greenfield 1988; Olsen 1971; Teeter and Chase 2004). This was especially true of later prehistoric cultures (Iron Age) in southern Africa, where the mention of zooarchaeological remains in archaeological site summaries were limited to broad assertions on the presence of bones or shells found in archaeological deposits (Thorp 1995: 2; Voigt 1983: IX) or none at all (cf. Schoeman 1998). These results were essentially devoid of cultural context. This is particularly evident in the research on the earliest farming communities in southern Africa (Plug 1984; Prins and Granger 1993; Rackman 1987; Voigt 1984).

The first farmers in southern Africa appeared during the Early Iron Age (ca. 300-1100 AD). However, little zooarchaeological research has been undertaken in the region in spite of the importance of studying early domestic stock for understanding the spread of food producing cultures across this region. According to Voigt (1983: IX), this is due to two reasons. First, attention beyond establishing a culture historic sequence in Early Iron Age archaeology only began to develop in the mid-1970s. Second, due to the exposed nature of Early Iron Age sites, bone preservation is greatly diminished by severe post-depositional taphonomic processes. As a result, most sites yielded only a few fragmentary and eroded bone remains. Therefore, there was little incentive to pursue zooarchaeological research in the region.

The purpose of this study is four-fold: 1) to determine if domesticates (cattle, sheep and goats) were preferred over the available wild resources in the region, 2) to clearly define the zoologically based dietary pattern of an EIA community 3) to ascertain the full extent and nature of utilization of the domesticated stock found at a site, and 4) whether the occupants exploited their domesticated stock primarily for their primary products (meat, hide, bone) for secondary products (e.g. milk or milk based goods), or a mixture of both.

This thesis will contribute to our understanding of the spread of early farming societies in southern Africa through a detailed zooarchaeological investigation of the remains from one of the best known EIA sites in the region – Ndondondwane, in the Lower Thukela Valley, within the province of KwaZulu-Natal (KZN), Republic of South Africa. Ndondondwane is the ceramic phase type site for the middle part of the EIA regional sequence. The occupation at the site is from a single ceramic phase and represents a very short term occupation (<50 years). Since time is factored out of much of the analysis from this site, it can be used as an example of a typical Early Iron Age homestead in eastern South Africa (Greenfield et al. 1997: 42; 2000: 5; Greenfield and van Schalkwyk 2003: 121-127; Loubser 1993: 109-112; Maggs 1984a: 71-75; van Schalkwyk et al. 1997: 61-64). Hence, the applicability of the results from this thesis can potentially be widespread.

II. Research Goals and Hypotheses

In order to fully comprehend the economic activities and dietary patterns of an EIA homestead from eastern South Africa, this thesis seeks to assess the validity of the following hypotheses using the zooarchaeological data excavated and analyzed from Ndondondwane.

A. Major Research Questions

Was the community at Ndondondwane more reliant on domesticated animals or were wild animals the primary protein source?

Is the animal portion of the economy narrowly focused (based on few taxa) or widely based?

What is the role of domestic animals?

Were they produced for their primary or secondary products?

Did the occupants of Ndondondwane rely most on primary or secondary products from their domesticated stock?

What is the role of wild animals in the economy?

Did the occupants of Ndondondwane pursue a mixed hunting and fishing strategy among the wild animals that was a reflection of the diverse availability of fauna in the wild?

In terms of the wild taxa, was the economy driven by a culturally selective strategy?

4) Is there a discernable differentiation of dietary patterns between the three chronological horizons identified by Greenfield and Miller (2004) at Ndondondwane?

a) If there is a change between horizons, what is the cause and nature of the shift and how did it affect the diet of the inhabitants?

B. Major Hypotheses

If domesticated animals dominate and wild animals are minimally present in the zooarchaeological assemblage, then domestic animals were the primary food source. This would support the preliminary analysis and conclusions drawn by Voigt and von den Driesch (1984). Conversely if wild taxa are found to be abundant in the assemblage, then the inhabitants of Ndondondwane practised a mixed subsistence economy utilizing a hunting strategy with domesticates as only a supplement to the overall economy.

Primary food source of domestic taxa.

If the people from Ndondondwane practiced a narrowly focused subsistence economy, then domestic taxa (cattle, goat and sheep) will dominate the zooarchaeological assemblage. There may be a higher concentration on a single domesticate taxon. On the contrary, evidence for a generalized subsistence economy at Ndondondwane would be indicated by a taxonomic diversity of domesticates intermixed with a variety of domestic and wild taxa in the assemblage (Cruz-Uribe 1988: 179; Schmitt and Lupo 1995: 496).

If the culling patterns of domesticates from Ndondondwane are dominated by younger individuals, then the animals were exploited with a focus on meat. While if older individuals are more representative in the zooarchaeological assemblage, then those living at Ndondondwane practiced an economy mixed with both primary and secondary products. The presence of specific butchery patterns or age at death groupings in the zooarchaeological assemblage will assist in ascertaining for which products the domesticated animal population were exploited at Ndondondwane.

If an age class and (if possible) sex-group culling pattern dominated by adults is discernible within the zooarchaeological record, then the inhabitants of Ndondondwane practiced a generalized domestic animal utilization strategy, combined with a strategy for maximizing herd maintenance. Whereby both primary and secondary products were exploited. In contrast, selective culling of younger age and sex groups would be indicative of a more specialized production strategy (Greenfield 1988: 573-575).

Wild taxa at Ndondondwane.

If the zooarchaeological assemblage is interspersed with fish bones, then the people of Ndondondwane utilized their environment fully to create a diverse subsistence economy.

If fish bone is absent from the assemblage, it is possible that cultural choice disregarded the harvesting of fish to supplement the subsistence economy.

If the analyzed zooarchaeological data is consistent throughout all three discernable chronological horizons, then there is no change in the overall subsistence strategy during the major shifts in occupation at Ndondondwane. If the zooarchaeological data is not consistent between all three horizons, then a shift in the subsistence strategy is apparent.

III. Method

The means by which an investigation is carried out takes place on many practical levels. At the highest level, there is method. This is followed by the more specific techniques and the technologies employed in conducting the analyses and testing the hypotheses (H. Greenfield, pers. comm.).

A. Method

Method is all about the general way in which an investigation is carried out (New Webster's Dictionary 1991: 628). In this study, the method of analysis will be Zooarchaeology – the study of animal bones from archaeological contexts (Davis 1987: 19; Reitz and Wing 1999: 1). Zooarchaeological analysis is the optimal method to use in order to determine the extent of the exploitation of animal resources. Animal remains in archaeological contexts not only reflect the behaviour pattern of human management and exploitation of animals, but also reveals specific information of the animals themselves. Through zooarchaeological analysis, one can reconstruct (1) the behaviour of ancient peoples, (2) the nature of the resources they exploited, and (3) the environment in which they lived (Davis 1984: 19).

B. Technique

Technique is all about the practical and specific means by which the analysis is executed (New Webster's Dictionary 1991: 1015). Specific techniques within Zooarchaeology that will be used in this analysis include the statistical distribution (raw and relative frequencies) of each taxon, each skeletal element and element part type, symmetry (siding) of each element or element fragment, level of fusion of each element and the corresponding age class including tooth eruption and wear.

Taphonomic influences are also major categories of analysis for this thesis. They include fragment size, condition, weathering and whether there exists any other visible damage to the bone.

Bone modification and butchering marks assist in the identification of cultural inferences to the zooarchaeological material. The method in which the animal was butchered, disarticulated and prepared to consume may aid in recognizing the full exploitation of the animal and corresponding cultural patterns present.

In order to determine taxonomic preferences, thus choice by the people themselves, the frequency of different domestic and wild taxa must be determined.

In order to determine exploitation strategies, the age of death of the different taxa must be determined. Grouping the assemblage within specific age classes will be accomplished through analysis of the epiphysial fusion of long bones and tooth wear and eruption identification on maxillary and mandibular teeth. These analytical techniques allow for the possible identification of culling patterns at Ndondondwane that may in turn determine the presence or absence of secondary product usage.

C. Technology

During analysis of the zooarchaeological materials excavated from Ndondondwane, several published osteological atlases were utilized to aid in the accurate identification of the various taxa present (i.e. von den Driesch 1976). Comparative collections were created through searching local regions for discarded known skeletal material, on loan from friends and associates and the use of the valuable and very complete faunal collection at the McGregor Museum in Kimberly (Northern Cape Province) and the National Museum in Bloemfontein (Free State Province).

All data were entered into large and extensive Microsoft® Excel spreadsheets in order to conduct full statistical analysis of the completed zooarchaeological assemblage from Ndondondwane. All tables generated during the analyses were created through the pivot table function in Excel.

All bones which could be measured were subjected to a series of measurements in accordance with von den Driesch's (1976) standard publication of measurements. In addition, a series of measurements that Greenfield (1986) established as supplements were also taken. These are used to establish the size, sex, and potentially the health of the animal population at the site.

IV. Data - Background to study site

In order to fully comprehend the absolute subsistence strategies of the inhabitants of Ndondondwane, it is the intention of this thesis to provide a detailed reconstruction of the homestead's economy during the Early Iron Age. This will be accomplished through a full analysis of the available zooarchaeological material excavated from all three archaeological campaigns: Maggs in 1978 (Maggs 1984), Loubser between 1982 and 1983 (Loubser 1993; 1998), and Greenfield et al. between 1995 and 1997 (Greenfield 1998; Greenfield and van Schalkwyk 2003; Greenfield et al. 1997, 2000, 2005; van Schalkwyk et al. 1997).

Ndondondwane was chosen for this research for a number of reasons. First, I was a member of the excavation and laboratory team during 1997 and laboratory team in 1998. As a result, I was given the opportunity to personally participate in the analysis of a portion of the zooarchaeological material from some of the field seasons and am familiar with the means by which it was collected and analyzed. Second, Dr. Haskel Greenfield has recently completed the basic field analysis of all of the remainder of the material from the 1982-83 and 1995-1997 excavations at the site. Third, Greenfield, Tina Jongsma and Matthew Singer compiled all of the zooarchaeological data from all of the field seasons at the site (1978, 1982-1983, 1995-1997) into a single comprehensive data base.

Fourth, I have received permission to analyze and summarize all of the faunal data from all of the campaigns at the site for this thesis.

A. Time period

The Early Iron Age in the eastern coastal regions of South Africa (ca. 300-1100 AD) began as Bantu-speaking, food-producing societies migrated southward from Central and East Africa, transporting the knowledge of new technologies with them (Maggs 1989; Smith 1992). In what is now known as KwaZulu-Natal Province, Republic of South Africa, they settled in coastal areas and along rivers in major inland river valleys, utilizing the fertile soil for crops such as millet (bulrush and finger) and sorghum, and the extensive pasture for grazing of cattle, sheep and goats, while creating richly decorated ceramics and other material culture.

A characteristic Early Iron Age community in KwaZulu-Natal will possess all or most of the following attributes (Maggs 1995; Phillipson 1977; van Schalkwyk et al. 1997; Voigt 1986):

iron smelting and forging;

animal husbandry as both an economic activity and source of nutrition;

cultivation of crops

settlements consisting of either semi-permanent or permanent villages/homesteads; and

production of pottery possessing characteristic decorative typologies(Holl 1998: 91; Maggs 1994/95: 173; Phillipson 1984: 273; Voigt 1986: 13).

All of these attributes can be clearly identified at the selected study site of Ndondondwane.

B. Region

The site is located within the country of the Republic of South Africa (RSA) south of the Saharan desert. The Republic of South Africa encompasses the entire southern tip of Africa, and is bordered to the north by the countries of (west to east) Namibia, Botswana, Zimbabwe and Mozambique, while completely circumventing the independent country of Lesotho and alongside Mozambique, Swaziland (Figure 1).

The site itself is situated within the lower basin of the Thukela River Valley, in the eastern province of KwaZulu-Natal (KZN) facing the Indian Ocean. The nearest major population centers to Ndondondwane are the inland city of Pietermaritzburg and the coastal city of Durban, both lying south of the site (Figures 1 and 2). The town of Ladysmith is located northwest of the site (Figure 1), while the small communities of Kranskop and Eshowe are found almost directly west and east of Ndondondwane, respectively.

C. Site

Ndondondwane, named after the nearby river crossing, is an Early Iron Age homestead site located on the eastern bank of the Thukela River at an elevation of 200 m above sea level. It is a single period occupation site, radiocarbon-dated to approximately c. 750 AD uncalibrated and c. 879-892 AD calibrated (Loubser 1993: 140; Maggs 1984a: 78; Whitelaw and Moon 1996: 74), with a maximum estimated length of occupation of approximately 50 years (which is exceptionally rare in southern Africa) (Greenfield et al. 1997: 42; 2005: 317). The site is located on a gentle sloping hillside, situated within a patch of deep colluvial (deep reddish-brown and loamy) soil and surrounded by savanna-bushveld vegetation (Loubser 1993; Maggs 1984). The Thukela River is one of the largest east-flowing rivers in KwaZulu-Natal and the only large body of water within the vicinity of the site (Maggs et al. 1986; van Schalkwyk 1995).

The site has been excavated by three major archaeological campaigns over a twenty year period: 1978 (Maggs 1984), 1982-1983 (Loubser 1993; 1998), and 1995-1997 (Greenfield and van Schalkwyk 2003; Greenfield et al. 1997, 2000; Greenfield 1998; van Schalkwyk et al. 1997). Furthermore, extensive analysis of various artefact categories has also been undertaken, including ceramics (Fowler 2002), ecofacts (Fowler et al. 2000, 2004), metals (Greenfield and Miller 2004), botanical (Maggs 1984a), and gardens (Greenfield et al. 2005). A preliminary zooarchaeological analysis of the 1978 season was conducted by Voigt and von den Driesch (1984), but nothing further has been published on the zooarchaeological remains.

Spatially, Ndondondwane appeared to be divided into two general areas: an outer arc of domestic compounds (including living structures, hearths, storage pits and features, burials, and middens) which surrounds a centralized area that contained a byre for domestic stock, and specialized activity areas for iron smelting, ivory carving and ceremonial purposes. The two areas are divided by a relatively empty space that is hypothesized to contain at least some of the fields or gardens of the community that demonstrates the existence of farming (Fowler et al. 2000; Greenfield and van Schalkwyk 2003; Greenfield et al. 1997, 2000; van Schalkwyk et al. 1997).

Recent reanalysis of the remains from the site has indicated that the deposits can be divided into three micro-phases within the single ceramic type phase. The earliest represents the colonization of the site, the middle represents the period of greatest growth of settlement, and the final represents the abandonment and post-abandonment activities

(Greenfield and van Schalkwyk 2003). The iron furnace dates to the final phase (Greenfield and Miller 2004).

D. Data – the fauna

Preliminary zooarchaeological analysis of the Ndondondwane fauna concurred with Maggs' (1989) observation of a reliance of domesticated animals (cattle, sheep and goats) for most of the subsistence of EIA communities in KwaZulu-Natal (Voigt and von den Driesch 1984). Voigt and von den Driesch (1984: 103) concluded the faunal assemblage from Ndondondwane held evidence that "few [other than hippopotamus] wild animals appear to have been hunted". They postulate that this was unusual for an Iron Age site (Voigt and von den Driesch 1984: 99), thus establishing the concept of a specialized diet reliant primarily upon domesticated stock in the Iron Age literature (Plug and Voigt 1985).

It may be possible that, since their analysis was limited to only the Mound Area of the homestead, it was not spatially representative and more wild remains will be found elsewhere on the site. Greenfield and van Schalkwyk's excavations tested each major area of occupation which provided a spatially representative sample of remains.

To fully understand the subsistence strategies of the homestead of Ndondondwane, the zooarchaeological remains from each of the excavated areas, encompassing the entire site, will be examined. The fauna were analyzed by Dr. H. Greenfield, with the assistance of myself, Tina Jongsma, Matthew Singer, Michelle Perles, and Claire Pfeiffer. The 1978 fauna were analyzed by Elizabeth Voigt and Angela von den Driesch (1984). Rather than reanalyzing all of the bones from their report, their raw data were provided by Elizabeth Voigt and are incorporated into the analysis.

V. Conclusion

This thesis will focus on reconstructing the subsistence strategies of a short term single occupation EIA site in the Lower Thukela Valley at the site of Ndondondwane. In particular, it will attempt to determine if a specialized diet of domestic animals (cattle, sheep and goats) was preferred over available wild resources in the region. Whether the wild populations were abundant or sparse as well as to clearly define the dietary choices made by this EIA community through zooarchaeological analysis. Furthermore, this thesis will determine the full degree of exploitation the domesticated stock was utilized at the site - primary and/or secondary products such as milk or milk based goods.

This thesis will contribute to the understanding of the spread of early farming societies into eastern South Africa through zooarchaeological investigations (Clutton-Brock 1995; Plug 1995; Plug and Voigt 1985; Plug and Pistorius 1999; Voigt 1984a, 1984c, 1986). This thesis is intended to be an addition to the ever- broadening understanding of the knowledge base of a time period delineated by a major cultural and technological shift in southern Africa, the Early Iron Age.

VI. Thesis Structure

The composition of this thesis is in a paper monograph format, with a series of chapters (chapters 2-7) where each chapter is an independently comprehensible essay. The maps, diagrams and tables that are discussed in this introductory chapter and subsequent chapters are found in the back of this manuscript and are referred to throughout the thesis.

Chapter two illustrates the EIA culture history of southern Africa and clarifies the process through which the EIA arrived into what is now KwaZulu-Natal (KZN) Province in the Republic of South Africa. Furthermore, this chapter describes the chronology of the EIA in KZN and provides a literary review of zooarchaeological analyses for three EIA sites that contain similar attributes to Ndondondwane. This presents subsistence strategies of EIA populations in the region by archaeologists and researchers.

Chapter three presents a literary review of modes of herding and herding practises in eastern and southern African historic and modern cultures and discusses the significance this brings to the investigation.

Chapter four describes the geographical location of the subject site, and the site of Ndondondwane itself. This chapter examines the exact locations of where the excavations were executed, what was found, the interpretation of the features and artifactual remains, and how this may have affected EIA archaeological research for subsequent excavations at the site and in the region. The features and activity areas at Ndondondwane are examined in three chronological stages that are separated by temporal cultural horizons found to exist throughout the site.

Chapter five focuses on the method and techniques undertaken to compile the zooarchaeological data base. It will include the methods used in the analysis and interpretation of the compiled data from the study site.

Chapter six provides the in-depth description of the results of zooarchaeological data analysis of the Ndondondwane assemblage.

Chapter seven consists of the interpretation of the zooarchaeological data. It will test the research questions and hypotheses presented in the introduction, and discuss interesting and relevant observations made in the process.

Chapter eight presents the conclusion of this thesis, tying in all aspects of the body of work. It will compare the results of Ndondondwane with other EIA zooarchaeological analyses from southern Africa in order to determine regional subsistence strategies.

Chapter 2: Culture history of the Early Iron Age in Southern Africa

I. Introduction

The overall goal of this chapter is to present a review of the culture history of the southeastern African region during the EIA. This chapter is divided into two major sections. The first section describes the general culture history, including how the EIA came into existence in southeastern Africa, chronology, settlement patterns, and the comprehension of these ancient cultures through archaeological data. The second section focuses on the subsistence system of the EIA cultures of the region. It will describe the botanical and zoological data recovered from nearby sites and the interpretations presented by the researchers.

II. Culture history of southeastern Africa

A. Arrival and beginning of the Early Iron Age into South Africa

The EIA located in eastern portion of southern Africa coincides with the introduction of the technology of iron smelting and forging, the first appearance of plant and animal domestication, the establishment of a mixed farming subsistence strategy, a sedentary settlement pattern and the first manufacturing and utilization of elaborately decorated ceramics south of the Zambezi River (Holl 1998: 91; Maggs 1994/95: 173; Phillipson 1984: 273; Voigt 1986: 13).

The establishment of the Iron Age of eastern South Africa is attributed to Bantu-speaking, food producing populations migrating in a series of individual streams and in several waves from Equatorial Africa (Figure 4). Independently, yet contemporaneously, stone tool using Khoikhoi pastoralist/hunter-gatherers also spread southward within a western migratory stream that eventually entered western South Africa through Namibia and down to the Cape (Figure 4). These food producing societies migrated to the eastern South African expanse and encountered the hunter-gatherer indigenous people of the region. When in the west, these hunter-gatherers adopted some of the trappings of food production in the form of animal domestication (mainly small stock) (Klein 1984; Mitchell 2002; Phillipson 2005: 249; Smith 1998). Interestingly, in KZN, the local hunter-gatherers never adopted the raising of domestic animals, but remained a stereotypical hunter-gatherer culture (Mitchell 2002: 248). The pre-Khosian pastoralist phenomenon was limited to the western populations. While domestic animal remains have been found in Late Stone Age rock shelters in KZN, it is hypothesized that the animals were either hunted or traded (Mazel 1989; Mitchell 2002: 248). They essentially remained stone tool users with a focus on a hunter-gatherer economy, and are therefore disregarded from this thesis. It is the EIA populations moving into the eastern regions of southern Africa (KZN) that is the focus for this zooarchaeological investigation.

The first Iron Age inhabitants of the KwaZulu-Natal region consisted solely of the eastern based migratory streams. According to pottery stylistic differences from archaeological sites, the EIA food producing societies traveled via these eastern streams southward from the eastern coastal and lowland areas as far north as eastern Kenya. The migration routes followed a southerly path through Tanzania, Malawi, eastern Zambia, Mozambique and Zimbabwe then into the Transvaal, Swaziland and KwaZulu-Natal areas of the Republic of South Africa (Figure 4) (Bousman 1998; Mitchell 2002: 261-263; Phillipson 1993, 2005: 250-252; Smith 1992).

The EIA in the KZN region can be divided into four major chronological-cultural phases. The earliest inception of the Iron Age consisted of a single ceramic (Matola) tradition, while the later and more mature portion of the EIA was composed of three distinct chronological-cultural phases. From earlier to later, these temporal cultural-chronological units are known as the Msuluzi, Ndondondwane and Ntshekane traditions. Each tradition is distinguished by stylistic changes of ceramic type. These are discussed below.

B. The Initial Early Iron Age

According to Maggs (1984b: 340), the incursion of the EIA cultures into southern Africa is more comparable to a massive surge southwards than a gradual flow. Archaeological evidence demonstrates that a majority of Matola and Matola-related sites from Kenya to KZN, South Africa (a 3200 km stretch from north to south) are all radiocarbon dated to within 150 years of each other. This is indicative of the rapidity that EIA economic strategies and technologies penetrated the hunter-gatherer lands of southern Africa (Clutton-Brock 2000: 34; Maggs 1984b: 340; Mitchell 2002: 272; Phillipson 1993: 188).

The earliest Iron Age cultural tradition has been identified as the 'Matola tradition', which was named after a 3rd century AD site found near Maputo Bay, in southern Mozambique (Maggs 1989, 1984b; Plug and Voigt 1985; Smith 1992). The KZN region appears to be the southernmost extension of the eastern migration route for the initial EIA from equatorial Africa (Huffman 1982: 135; Maggs 1989: 29-31).

As they penetrated the KwaZulu-Natal region, contributors to the Matola tradition sites had already exhibited a majority of the cultural traits fully established throughout all later EIA settlements. The KZN Matola tradition is now recognized to be part of the larger Mzonjani EIA tradition characteristic of southeastern Africa (Bousman 1998;

Maggs 1984b, 1984c, 1989; Mitchell 2002; Plug and Voigt 1985). The incipient stage for Iron Age traits found at Matola sites include: (1) temporary settlements; (2) some evidence of iron manufacture (found in only a few sites and are normally smaller in scale); (3) introduction into the production and utilization of ceramics; (4) inception of crop cultivation (bulrush and pearl millet and sorghum), and; (5) some animal domestication (unfortunately due to extremely poor preservation of bone from this early phase, the full extent of animal domestication is yet unknown, however, it is thought that the early domesticates would consist mainly of sheep and goats [small stock] with evidence of some cattle interspersed in the assemblages) (Bousman 1998; Maggs 1984b, 1984c, 1989; Mitchell 2002; Plug and Voigt 1985; Whitelaw and Moon 1996).

The people of the Matola culture rapidly spread over a wide area of the eastern seaboard of southern Africa. They extended from central Mozambique as far south as the vicinity of Scottsburgh, south of Durban (Whitelaw and Moon 1996: 68) (Figure 1). However, they did not penetrate inland for any great distance (a maximum of 6-8 km from the coast). These sites are primarily located on the "inland foot" of a belt of ancient Pleistocene dunes along the coast or slightly inland (Maggs 1989: 31; Whitelaw and Moon 1996: 53, 68). The sites were generally found occupying areas more suitable for the cultivation of cereal crops, such as bulrush millet (*Pennisetum typhoides*) and sorghum, and were normally occupied for an average period of only a few years (Maggs 1984b, 1984c, 1989).

Matola sites in KZN consist of relatively small, scattered settlements of approximately 2 to 3 hectares in size (Maggs 1989: 31; Phillipson 2005: 254). This tradition is thought to be comprised of small groups of "slash-and-burn cultivators, moving into a landscape sparsely inhabited by Khosian hunter-gatherers" (Maggs 1989: 31).

Overall, little is known of the settlement structure of Matola communities in the KZN region. It is suspected that the living structures consisted of rounded thatch huts and that storage pits were excavated nearby for protected containment of the harvested crops. Very little has been found and comprehended from these sites during this period (Maggs 1989: 31-32; Phillipson 2005: 260-262).

People of the Matola culture group brought with them EIA agricultural practices developed to the north. These cultural practices were continued into the later EIA (Maggs 1989; Phillipson 2005: 260). The typical subsistence strategy during the Matola temporal period was infused with domesticated species of both plant and animals, but remained a hunter-gatherer style of economy. For example, the Matola populations heavily exploited marine resources, such as mussels and marine mammals, as well as wild plants and animals from inland areas (Maggs 1989; Phillipson 2005: 260). In fact, Whitelaw and Moon (1996: 68) suggest that choice of site location, strictly within the KZN region, was related to the mussel colonies found on rocky outcrops along sections of the coast – almost always in close proximity. This model of Matola tradition site selection is further corroborated when comparing the accessibility of iron smelting sites to iron ore deposits (Whitelaw and Moon 1996: 69-70). Clearly, site location is consciously selected with a specific range of criteria in mind.

The presence of lower grindstones with elliptical grooves through the centre, along with faceted upper grindstones, is indicative of agricultural exploitation at these initial EIA sites (Whitelaw 1993: 67). Lower grindstones from KZN exhibiting a narrowed elliptical groove are for the more specialized grinding of millet and sorghum seeds (Mitchell 2002: 272-273). A majority of the Matola tradition sites in KZN have been found to contain such tools (Mitchell 2002: 273; Whitelaw and Moon 1996: 67).

It is the ceramics that are the major bond which connects these scattered initial EIA sites into one tradition. Typically, the vessels possess straight necks with everted rims at a distinctive angle flowing away from the vessel body, occasionally with multiple bevelling or with a fluted lip (Maggs 1984b: 331). Standard decorative characteristics for Matola tradition ceramics consists of either (1) a groove below the lip; (2) a band of decoration, mainly oblique hatching; (3) multiple oblique rows of impressions below the lip and around the neck; or (4) a combination of any of the above motifs (Maggs 1984b: 331; Whitelaw and Moon 1996: 61-67).

Due to a change in coastal climatic conditions and an adapted need of iron ore, most archaeologists believe that the Matola tradition evolved into the later EIA traditions as the population expanded inland from the coast, and there was an increase in dependence on domesticated species for subsistence (Mitchell 2002: 273-274; Whitelaw and Moon 1996: 67-68).

C. The later and developed Early Iron Age

Artifacts from the later Early Iron Age have been radiocarbon dated to between ca. 500 and 1000 AD (uncalibrated). This period was marked by a great expansion of EIA populations inland (Mitchell 2002: 259). There was an increase in the number and density of sites all over the region, but within narrow environmental limits. More settled inland regions and a dramatic population increase at this time is partially attributed to the full scale implementation of farming together with advantages derived from the use of iron tools for land clearing and cultivation (Mitchell 2002: 259).

These newest EIA sites are invariantly confined to coastal areas and floors of the major river valleys of the eastern coast of KZN, such as the Thukela River valley (van Schalkwyk 1994/1995). The common inter-site spatial patterning appears to be settlement locations on the lower slope of a valley, adjacent to a major stream or river. The settlements were then built on patches of deep colluvial alkaline soil which is optimal for dry land cultivation (van Schalkwyk 1994/1995).

The standard characteristics of the inland settlements of the later EIA are slightly different and more developed than those found in the incipient EIA. They consisted of: (1) larger, more permanent sites that demonstrated more of a self-sufficient nature, both economically and politically; (2) preference for fertile soil for cultivation in immediate proximity to the living areas; (3) location near a body of running fresh water; (4) year round grazing capabilities for domesticated livestock; (5) adequate precipitation for domestic grain cultivation; and (6) access to a large supply of wood for hut and kraal construction, and cooking fires for iron-making purposes (Maggs 1984b, 1994/1995; Plug and Voigt 1985). In some situations, there appeared to be a preference for locations to be in close proximity to magnetite deposits, a high-quality iron ore used for smelting and tool manufacture. Examples from the region include the sites of Ndondondwane, Wosi and Mamba in the lower Thukela Basin (van Schalkwyk 1994/1995: 193).

The typical settlement pattern at this time consisted of semi-permanent to permanent villages or homesteads, likely consisting of living structures with domed-shaped thatched roofs and walls of thatch mixed with wattle and daub construction, built within a pole framework with daga (mud) (Plug and Voigt 1985). These structures are traditionally known in the Zulu language as *iqhugwane* ((Mack et. al. 1991). A number of EIA sites throughout KZN (including Ndondondwane) were found to possess fragments of charred daga with stick and thatch impressions that demonstrate a widespread uniformity of hut construction in the EIA (Maggs 1984b).

The later EIA populations developed ceramics with more elaborately ornate styles of decoration, demonstrated a greater dependency on domesticated plants (sorghum and millet) and animals (including the introduction of the domesticated dog and chicken, in addition to the sheep, goats and cattle from the Matola migrations). They constructed specialized iron smelting areas within certain villages/homesteads that in turn produced settlements of a more permanent nature (Maggs 1989; Mitchell 2002; Phillipson 1993; Plug and Voigt 1985; Voigt and von den Driesch 1984; Voigt 1984a). Also characteristic of later EIA sites in KZN are the presence of shell disc beads, bone arrowheads and link shafts, ceramic sculpture and pits primarily used for grain storage (Maggs 1984c). The latter features were occasionally utilized as a refuse pits or for the burial of infants in complete pots – e.g. Ndondondwane (Greenfield and van Schalkwyk 2003; Greenfield et al. 1997, 2000; Mitchell 2002; van Schalkwyk et al. 1997).

Both the immigrating Bantu-speakers and the indigenous hunter-gatherer populations appeared to have co-existed throughout southeastern Africa, establishing an exchange of goods and cultural traits until the influx of Dutch settlers. For example, there is evidence that the hunter-gatherers adopted some small stock animal (sheep/goats) domestication practices and the use of ceramics (Gifford-Gonzalez 2000; Mitchell 2002). Conversely, bone tools in the form of link shafts and points that closely resemble those used by the hunter-gatherers are found at a number of EIA sites, including Ndondondwane (Maggs and Whitelaw 1991; Fread 1999), Wosi (van Schalkwyk 1994a; Voigt and Peters 1994a) and KwaGandaganda (Whitelaw 1994).

Additional goods found at EIA sites indicative of trade networks during this period of South African history include remains of animals and mollusc shells not thought endemic to KZN. Ostrich egg shell beads have been found to be plentiful in certain EIA sites (Ndondondwane). In rare circumstances, EIA site excavations have uncovered glass beads and glazed ceramics brought by Islamic traders who incorporated trade networks off the east coast of Africa (Mozambique and Tanzania) during the later period of the EIA (Mitchell 2002; Phillipson 1993; Plug 1995; Smith 1998; Whitelaw 1994).

The developed EIA in KZN witnessed a widespread commonality in decorated ceramics. Mitchell (2002: 298) likens this ceramic standardization to the requirement for exogamous marriages between several widespread, low-density, populations. Furthermore, these standardized ceramics may represent a similar extensive belief structure that generated the need for constant interaction, which in turn created a resource-sharing tradition that formed an "insurance policy" during times of localized droughts or moments where there was little food available in a community (Mitchell 2002: 298).

The post-Matola traditions of the EIA consisted of three distinct pottery and temporal traditions within the KZN region. These three phases were Msuluzi; Ndondondwane; and Ntshekane, in respective temporal order. All three of the later EIA ceramics styles are relatively homogeneous with respect to one another when compared to the Late Iron Age (LIA) (Maggs 1989), demonstrating a closely knit relationship of stylistic attributes of EIA pottery decoration in this region (Mitchell 2002: 264-267) (Figure 5).

1. The Msuluzi tradition

The Msuluzi tradition represents the earliest phase of the developed EIA of KZN. It is associated with the spread of the Bantu-speaking populations inland from the coastal regions, occupying deeply incised river valleys (Maggs 1989: 32).

This ceramic phase has been dated from between the 5th/6th to 8th centuries AD (Maggs 1989; Prins 1995; Whitelaw and Moon 1996). It represents the initial spread of settlement from the coast into the interior east-west valleys. Msuluzi settlements are more widely distributed across KZN and the region is more densely occupied than in the earlier Matola phase (Maggs 1989; Prins 1995; Whitelaw and Moon 1996). There exists no archaeological evidence of settlement hierarchies during this period (Greenfield and van Schalkwyk n.d.).

The ceramics, especially the pots, are identifiable as Msuluzi through the concave, everted necks that typically possess several horizontal bands of decoration below the lip. Decoration on the body may contain banding or discontinuous motifs (Maggs 1984b: 333). Overall, Msuluzi ceramics are characterized by a much broader range of motifs than that of the Matola tradition (Maggs 1984b) (Figure 5).

Ceramic figurines and ceremonial masks begin to appear during this temporal phase. They have been recovered from concentrated locations within some complex sites during the Ndondondwane phase (Mitchell 2002: 289).

Evidence for the presence of iron smelting activities began to greatly amplify with the onset of the Msuluzi tradition (Mitchell 2002: 279-282). As noted earlier, as populations moved their way into the interior, settlements were created within the vicinity of iron ore deposits for more convenient resource harvesting.

Settlement size and numbers increased during the developed EIA. In KZN, typical site sizes were in the range of 4-5 hectare sites, but vastly larger sites are also found (up to 10 ha). The larger sites are considered to be examples of laterally displaced settlement areas that were not occupied at the same point in time (Greenfield pers. comm.).

EIA sites from the Msuluzi phase onwards all contain similar standard intra-site features. These include storage pits (usually found near hut floors), middens, grain bin foundations, iron forging and/or smelting areas and animal kraals (Mitchell 2002: 279-282).

2. The Ndondondwane tradition

The Ndondondwane phase (between the 8th to 9th centuries AD) was first identified by Tim Maggs during the excavation of the site of Ndondondwane (1984a). Although stylistically individualistic enough to warrant a separate temporal sequence based on decorative changes, its basic ceramic decorative attributes still exhibit a heavy Msuluzi phase influence (Maggs 1984a, 1989) (see chapter 4). The Ndondondwane ceramic tradition is the particular temporal unit that encapsulated the estimated time segment of this thesis and the subject site of Ndondondwane.

Ndondondwane phase ceramics appear further south, extending into the Eastern Cape regions of South Africa than the previous Matola and Msuluzi Phases (Mitchell

2002: 268; Prins and Grainger 1993). They represent the farthest southern extent of EIA sites for the region (Mitchell 2002; 259).

Ceramic pot motifs along with mask fragments found at the Ndondondwane site are strikingly similar to the pots and masks recovered at the Lydenburg Heads Site (Inskeep and Maggs 1975; Loubser 1993; Mitchell 2002).

The most typical decorative styles of the Ndondondwane pots possess one to three bands of decoration along the lower portion of the vessel neck. Common motifs include hatching and/or cross-hatching with multiple neck bands that hold similarity to Msuluzi phase ceramics. Body decoration rarely occurred, though when present it is typically in the shape of ladders and/or pendant triangular appliqués (Loubser 1993: 124-132; Maggs 1984a: 78-85; Whitelaw 1994: 17).

3. The Ntshekane tradition

The Ntshekane ceramic tradition (9^{th} to 11^{th} century AD) constitutes the final ceramic phase of the EIA. Accordingly, the Ntshekane phase is the last ceramic phase of the EIA in the Thukela region and marks the transition into the LIA by the end of the 10^{th} century and into the early 11^{th} century AD.

The size and spatial layout of sites from this phase are reminiscent of sites from earlier phases (Msuluzi and Ndondondwane). Though Ntshekane sites are representative of the last EIA phase, the commonalities of EIA traits are still present. Numerous sites in fact were continuously occupied from the Msuluzi phase to the end of the EIA, for example, KwaGandaganda (Whitelaw 1994).

Ntshekane ceramics are easier to differentiate from the earlier phases due to the characteristic profile common to these latest EIA phase pots. Hatching and cross-hatching are the most dominant motifs during this phase, with interrupted banding or bands with opposed hatching and no intervening grooves (Whitelaw 1994: 17).

Ntshekane sites are not as numerous as those of Msuluzi and Ndondondwane phase sites (Greenfield and van Schalkwyk n.d.; Maggs 1989; van Schalkwyk 1994/1995). This may indicate that environmental degradation of the savannah regions from long term occupation and weather fluctuations, specifically drastic temperature and precipitation changes, greatly altered the delicate ecology of the EIA habitats in KZN (Maggs 1989; Prins 1994). Recent surveys of the Thukela valley and data from other valleys along the eastern seaboard have demonstrated that there existed widespread population collapses during this phase (Greenfield and van Schalkwyk n.d.; van Schalkwyk 1994/5). This represents the final prehistoric occupation major river valleys during the Iron Age. Only in modern times were the valleys reoccupied.

III. Early Iron Age subsistence

In this section, the nature of EIA subsistence will be described based upon the results of previous research in southern Africa. Subsistence is comprised of two segments of the economy – plant and animal.

The arrival of food producing EIA societies migrating throughout eastern South Africa ushered a new subsistence and economic strategy into the undulating terrain of KZN. The first segment of this incipient phase of the EIA (Matola) witnessed the introduction of plant and animal domestication that merely supplemented a pseudo hunter-gatherer form of subsistence (Maggs 1989; Whitelaw and Moon 1996). As the later EIA cultures developed in southeastern Africa, the focus of exploitation shifted towards an emphasis upon domesticated plant and animal species. This superseded the previous strategy due to the perception that herding and agriculture offered more advantages over the existing hunting and gathering strategies (Maggs 1989: 32; Marshall and Hildebrand 2002: 121; Mitchell 2002: 274). Overall, the EIA subsistence in the KZN region was based on a mixed agricultural and pastoralist specialized economy, with some supplemental hunting and gathering of wild species (Maggs 1989: 32).

A. Botanical

The presence of upper and lower grindstones at EIA sites in KZN is the most conclusive indicators that agriculture had been implemented during this period. The lower grindstones normally contain elliptical grooves in the centre of the large stones from continuous use wear. These marks are generally associated with the grinding of millet and sorghum grains (Whitelaw and Moon 1996).

The Matola tradition sites (during the initial phase of the EIA) occupied Pleistocene dune deposits that were more suitable for the cultivation of cereal crops, such as bulrush millet (*Pennisetum americanum*) and sorghum. They practiced a slash-and-burn agricultural economy that yielded crops for only a few years before the soils lost all nutrients, requiring the constant need for new locations, thus promoting a semi-sedentary existence (Maggs 1984b, 1984c, 1989; Whitelaw and Moon 1996: 68).

The more developed stages of the later EIA saw the expansion of cultivation. Bulrush millet and sorghum continued to be exploited, but new species were also introduced - finger millet and possibly melons and gourds (Maggs 1989: 32). The spread of sites across the landscape also may be interpreted to indicate that there was a concomitant expansion of cultivated areas (with consequent deforestation of the landscape).

Numerous wild species of plants continued to be gathered for food and medicinal purposes. Excavations at Ndondondwane (Maggs 1984a; Loubser 1993; Greenfield et al. 2005) and KwaGandaganda (Whitelaw 1994) revealed evidence of a diverse collection of gathered plants. Exploitation of the marula nut for example, is well documented in areas such as Zimbabwe and Botswana, with evidence of nut collection from sites in KZN (Greenfield et al. 2005; Loubser 1993; Maggs 1984a). Wild plant resources were most likely deemed highly important alongside the cultivated species (Mitchell 2002: 274).

B. Zoological

The initial E IA subsistence strategy consisted of a pseudo hunter-gatherer economy supplemented with some domestic stock of mainly sheep and goat. While cattle bones have been found at Matola sites, the significance of their presence has been debated (Holl 1998: 91; Smith 2000: 228). Zooarchaeologists claim they are domestic (Plug and Voigt 1985: 205; Whitelaw and Moon 1996: 60), while this has been questioned by some archaeologists because of the level of bone fragmentation and poor preservation (Smith 2000: 228).

The collection of marine resources such as mussels and the hunting of marine mammals appeared to have been a major source of sustenance for many of the coastal sites (Mitchell 2002: 274-275; Whitelaw and Moon 1996: 68). The use of shellfish in EIA diets appears to be quite extensive, especially (though not solely) along the coast. The brown mussel (*Perna perna*) which is still found in extensive numbers in the region, are simple to harvest and are a very energy rich food source (Mitchell 2002: 274-275). Some coastal sites in KZN for example, are essentially just massive shell middens, interspersed with cultural material.

In the later EIA, the significance of coastal resources declined, with an increased focus on animal husbandry. This phase is marked by a considerable drop in the number of later EIA sites along the coast for more favourable inland river valley sites that contain large patches of sweetgrass for grazing (Plug and Voigt 1985: 205). There is some archaeological evidence that points to seasonal shellfish collecting by inland EIA food producing societies in the form of *Perna perna* shells present in inland sites (Mitchell 2002: 275).The sourcing of quartz inclusions from EIA ceramics excavated from coastal sites has determined that sources up to 20 to 40 kilometres inland were being exploited. Ceramics on coastal sites have been sourced to locations near inland KwaGandaganda. This has been interpreted as a result of either seasonal movement back and forth from the inland to the coast or trade between coastal and inland communities (Maggs 1984b: 339; Mitchell 2002: 275; Plug and Voigt 1985: 225; Whitelaw 1994).

A majority of zooarchaeological assemblages from EIA sites in KZN possess a considerably larger frequency of domesticate than wild species. Ovicaprines (sheep and goats) in most sites far outnumber cattle (Mitchell 2002; Plug 1993, 1996; Plug and Voigt 1985; Voigt and von den Driesch 1984). The following section will provide a brief summary of the zooarchaeological remains from three EIA sites in KZN (KwaGandaganda, Wosi and Mamba I).

1. KwaGandaganda

KwaGandaganda, an EIA site that spans all three of the later EIA phases (Msuluzi, Ndondondwane and Ntshekane) is located in the Mngeni river valley near Durban (Whitelaw 1994: 2). KwaGandaganda occupied over six hectares of land at a south bend of the river. This site contained a NISP of 41,006 zooarchaeological material fragments of both bone and shell, from which a NISP of 9,374 (22.9%) were identifiable (Beukes unpublished manuscript: 61 and Appendices).

Sixty-eight species were present at the site, from mammals to birds, fish and molluscs. The domesticates amounted to 76.4% of the identifiable fragments with *Bos taurus* (cattle) at 26.9%; *Ovis aries* (sheep) at 4.5%; *Capra hircus* (goat) at 0.7%; and the indistinguishable fragments of either *Ovis aries* or *Capra hircus* (sheep/goat) at 44.2%. The domestic dog and chicken were also found to be present at KwaGandaganda (Beukes unpublished manuscript: 61 and Appendices). Thus the caprines outnumber cattle by a ratio of 2:1.

The wild species amounted to just over 23% of the complete identifiable assemblage (a NISP of approximately 2225 identifiable fragments). The bushpig was the most dominant species present at less than 10%, while the common duiker (4.5%), blue duiker (4.2%), Cape buffalo (2.9%) and impala (2.7%) were the remaining dominant species at KwaGandaganda. Other species identified were elephant, hippo, giraffe, eland, kudu, mountain reedbuck, reedbuck, waterbuck, bushbuck, steenbok, warthog and zebra. A large amount of small fauna that included hares/rabbits, rodents, amphibians, reptiles and molluscs were also found to be present (Beukes unpublished manuscript: 61, figures and appendices).

2. Wosi

Wosi is associated with ceramics from the Msuluzi and Ndondondwane phases. This site consisted of ten hectares of occupied soil and is located on the lower Thukela, just 1500m downstream from Ndondondwane and in close proximity to Mamba (van Schalkwyk 1994a: Voigt and Peters 1994a). Zooarchaeological analysis determined that a

NISP of 6,855 bone, shell and fragments were identifiable from a total assemblage of 28, 304 fragments (24.2%) with fifty-two species identified. The domesticated species amounted to a NISP of 5,624 identifiable fragments (82%) with cattle at 3.8%, sheep at 24.4%, goats at 1.1%, and the indistinguishable sheep/goat specimens at 70.5%. Domesticated dog amounted to 0.2% of the overall domestic assemblage, but was likely not used for meat (Voigt and Peters 1994a: 106-107). At over 95% of the domestic assemblage, the sheep and goat population represented the dominant source of meat from Wosi.

The wild portion of the assemblage (18% of the total identifiable zooarchaeological material) was dominated by the common duiker (*Sylvicapra grimmia*) at 12.9% of wild total. Although elephant amounts to 23.6% of the wild assemblage, it is due to the presence of individual fragments of ivory from carving and not bone fragments associated with sustenance. Hippopotamus (2.1%) were also found to be present at the site in context of ivory carving. Other large wild mammal species identified as present at Wosi include: blue duiker (3.7%); red duiker (0.41%); impala (0.24%); bushbuck (1 fragment); mountain reedbuck (0.49%); blue wildebeest (1 fragment); bushpig (0.65%); warthog (0.41%) and zebra (1 fragment) (Voigt and Peters 1994a: 106-107). The majority of other mammalian wild remains could only be classified as Bovid and assigned a size category (from the smallest to largest, Bovid I, II, III, and IV). The presence of small fauna was also found in large amounts throughout the site.

3. Mamba

The EIA site of Mamba consisted of two sites (Mamba I and Mamba II) across the Mamba River from each other. The sites are located at the confluence of the Mamba and Thukela rivers in the lower Thukela Valley. Mamba I held the only zooarchaeological assemblage that was analyzed by Voigt and Peters (1994b). Therefore, only the data from this site will be discussed.

Mamba I consisted of an eight hectare site that contained the remains of a large iron smelting activity area (van Schalkwyk 1994b: 119). Located at the west side of the Mamba river, this seventh to eighth century site contained a small zooarchaeological assemblage for analysis (van Schalkwyk 1994b: 119; Voigt and Peters 1994b: 145), which still allows for an appropriate comprehension of the subsistence strategy of the site.

Domesticates represented over 86% of the overall identifiable fragments (NISP 1136) at Mamba I. Cattle were the most dominate species represented at 66% of the total domesticate assemblage, with caprines at just over 30%. There was only one goat specimen positively identified from the assemblage and only a few sheep, the remaining material was assigned to the caprines grouping. The domestic dog was identified at less than 2% of the domesticate population represented by the zooarchaeological assemblage (Voigt and Peters 1994b: 145-147). Overall, cattle from Mamba I outnumbered the caprines at a ratio of 2:1.

From the wild assemblage at Mamba I, the common duiker is the dominant species identified (24.5%), followed by mountain reedbuck (4.5%). Other bovid (antelope) species present included: bushbuck, waterbuck and impala. Rodents and molluscs represent the majority of the remaining wild assemblage, which may be an example of both gathering strategies and intrusive species. The presence of carnivores (both canid and felid), indicate hunting for purposes other than subsistence. Lastly, it was not clarified whether the occurrence of hippopotamus and elephant at Mamba I represented ivory carving or sustenance (Voigt and Peters 1994b: 143-149).

Upon examination of the zooarchaeological remains from all three of the EIA sites (KwaGandaganda, Wosi and Mamba I), the dependence on domesticates over wild animals is quite clear. The domesticated species, on average, amounted to over 81% of the overall assemblages. This total is probably reduced due to the presence of intrusive species in the analyses. For example, some rodents, amphibians and reptiles were likely not utilized as sustenance but either co-existed with the settlement or was present after site abandonment (Voigt 1984: 151).

As demonstrated above, the EIA economy in southeastern Africa is noted for a remarkable paucity of wild animal remains. The presence of hunter-gatherer goods, such as bone link shafts and points, ostrich eggshell beads and stone implements, at a majority of EIA sites may be representative of a centuries old trade network between agro-pastoralists and their nomadic neighbours (Maggs 1989: 32-33). The presence of ostrich eggshells at EIA sites in KZN is especially interesting due to the lack of any evidence that ostriches ever existed in these valley woodland areas.

IV. Conclusion

A. Summary

The first food producing societies migrated southwards from equatorial Africa into southeastern Africa early in the first millennium AD. These Bantu-speaking populations brought with them knowledge of iron smelting and forging, the creation and usage of elaborately decorated ceramics and the domestication of a variety of plant and animal species. The EIA is also marked by the presence of semi-permanent villages/homesteads commonly found in deeply incised river valleys near major bodies of water.

The emergence of the EIA in southeastern Africa is defined by four major chronological-cultural ceramic traditions. The earliest inception of the Iron Age consisted of the Matola tradition, while the later and more developed segment of the EIA is made up of three distinct, yet overlapping, chronological-cultural phases, the Msuluzi, Ndondondwane and Ntshekane traditions.

A literary review of zooarchaeological analyses of three archaeological sites was provided. The combined results indicate a focus on herding practices of the domesticated species of cattle, sheep and goats, while the presence of the dog and house rat were also identified. Although rare during this period, the chicken has also been known to exist as a domesticated species at EIA sites.

B. Significance (Discussion)

Through literature review of archaeological and zooarchaeological investigations on EIA sites within the area of study, a regional subsistence pattern was presented. The Matola tradition followed a pseudo Iron Age diet of some domesticates that supplemented the main diet of wild marine and terrestrial fauna and flora. The three later temporal periods demonstrated tendencies toward a focus on domesticates for sustenance.

The zooarchaeological assemblages consisted of the presence of domesticates on an average scale of over 80% of the assemblages, with caprines commonly dominating the stock by a ratio of 2:1 over cattle. There is little evidence for the exploitation of wild animals in the later periods, with the common duiker being the most frequently hunted bovid (antelope) and a majority of the wild assemblage consisting of snared, gathered or intrusive fauna over those that are hunted.

This chapter described the culture history of the region of study with a literature review of the subsistence strategies of several sites that are excellent representations of the typical EIA site in KZN. The next chapter will examine the historic and modern herding practices of pastoralists and agro-pastoralists of eastern and southern Africa. Chapters two and three provide a basis of understanding of past and present herding activities in southeastern Africa. With this literary review, comprehension of the herding practices at Ndondondwane will become more readily apparent after the results of the zooarchaeological analysis are provided.

Chapter 3: Ethnographic herding patterns in Eastern and Southern Africa

I. Introduction

The shift from hunting and gathering to animal husbandry created an extremely close yet different type of relationship between “man and beast”. Domestication involved the alteration of the physical and behavioural characteristics of a species to make the animal dependant, more controllable, and/or productive. This was accomplished through the controlled breeding and artificial selection of an animal species. At the same time, humans modified their own culture and technology to efficiently manage the livestock (Reitz and Wing 1999; Davis 1987).

Peoples of the EIA cultures of southern Africa relied heavily upon domestic stock for their subsistence, even though they were agro-pastoralists (see chapter 2). This chapter examines the literature on herding practices and domesticated animal exploitation by ethnographic research of recent historic and modern cultures in eastern and southern Africa. The following review is intended to provide a baseline for comparison between the historic herding practices in the region and the zooarchaeological data from Ndondondwane (to be presented in subsequent chapters of this thesis). More recently, colonial influences have been known to dramatically impact and alter subsistence strategies of certain societies in Africa creating more complex situations (Smith 2005: 7-8). But, these are not dealt with here since they are considered to have little relevancy to the EIA.

II. Modes of production among pastoral and agro-pastoral societies in south and east Africa

There were two basic types of eastern and southern African societies that relied upon domestic stock for their subsistence. Pastoralists consist of societies that primarily depend on domesticated livestock. Agro-pastoralists are those that rely upon both domestic stock and agricultural products for their subsistence. A majority of livestock keeping societies in sub-Saharan Africa today consist of some form of agro-pastoralism (Bonte and Galaty 1991: 6-9).

The settlement and movement strategies of these two types of societies reflect the differing needs of their herds and other sources of subsistence. Pastoral societies are relatively mobile, while agro-pastoral societies tend to be more sedentary (Fratkin 1998: 78).

Pastoralists have to be attuned to the specific needs of their herds and be in constant search of fresh grasslands with access of potable water. Agro-pastoralists live in close proximity to relatively permanent water sources and more predictable grazing areas for their stock because of the needs of field cultivation, which need relatively moist soils in order to thrive through the dry and/or unpredictable rainfall seasons (Bonte and Galaty 1991: 8-9; Fratkin 1998: 67).

Pastoralism, in general, is most often an adaptation to the semi-arid open country in which farming cannot be easily sustained without irrigation. Pastoralism is usually the optimal subsistence pattern in these areas because it allows considerable independence from any particular local environment. Pastoralists manage their herds with the increase in herd growth as the basic strategy. The larger the herd size, the greater the probability that the herd and pastoralists will survive drought, disease or any other major catastrophe. When there is a drought, pastoralists are able to disperse their herds or move them to new areas. Agriculturalists rarely have similar alternatives. If drought occurs or they suffer crop failure from disease, starvation may be the end result. However, an agro-pastoral subsistence strategy greatly increases local productivity of domesticates (crop and herd), thereby reducing fluctuations in food availability. Pastoralists, as ecological specialists, are at greater risk when there is either an irregular climatic pattern or the likely chance of a catastrophic climatic event (Bonte 1991: 77-80; Bonte and Galaty 1991: 9; Marshall 1990: 873-879; Reid 1996: 49). Although, according to Bonte and Galaty (1991: 15-16), no strictly pastoralist diet within a society actually exists. All pastoralist groups enter into some form of trade or exchange with other local non-pastoral groups to attain access to agricultural goods that will act as dietary supplements. Other pastoralists incorporate some farming (i.e. Nuer) into their subsistence strategies. In eastern and southern Africa, these goods were usually sorghum, millet or maize. A secondary effect to this exchange is the creation of trade networks and the development of a larger complementary form of exploitation between groups using different subsistence strategies in the same or proximate environments (Smith 2005: 23).

A. Pastoralists

There exist two major types of pastoralists in eastern and southern Africa. This is due to adaptation to specific environmental and climatic conditions as well as changes in subsistence economic focus within a culture group.

Nomadic pastoralists are normally found in arid sections of sub-Saharan Africa, as these areas receive too little precipitation for agriculture. Due to the need to be highly mobile, their material culture is generally small and highly portable. Nomadic pastoralists are also more unpredictable in their seasonal movements than transhumant pastoralists. They often move laterally within broad regions, rather than vertically (as do transhumant pastoralists) (Blench 1985: 5-6; Hogg 1985: 1; Smith 2005: 4-5).

While nomadic pastoralism is more of a random style of movement, transhumant pastoralism is characterized by yearly migrations between altitudinally differentiated pastures. These groups are more sedentary than nomadic pastoralists since they often possess permanent residences. In transhumance, it is the stock (and a few shepherds) and not the entire society that moves between pastures. Transhumant pastoralists maintain herds that are either too large to be sustained year round at a single location or climatic conditions require seasonal movement of a majority of the livestock. In certain African climates, the seasonal movement of herds is necessary to escape the pressure of trypanosome-carrying tsetse flies. Agriculture, if present is on a smaller scale due to the need for seasonal mobility and herding requirements (Blench 1985: 6; Mitchell 2005: 59; Smith 2005: 6-8).

Not all pastoral societies can be accurately described as following a specific mode of herding. As climatic and environmental conditions change, pastoralists usually adapt and adjust. This may result in a traditionally nomadic pastoralist society or some families within in it becoming more or less transhumant in their migratory patterns if the opportunity presents itself. Conversely, a society that is transhumant may be forced by uncontrolled circumstances to change to a nomadic pastoralist pattern to sustain some or all of its livestock. This has been found in the archaeological record and may be attributed to the development of more complex herding practices (Barich 2002).

B. Agro-Pastoralists (mixed farming)

In this type of production, the societies retain smaller quantities of domestic stock than found among pastoralists given that their subsistence is more diversified. Occasionally it relies more heavily on livestock and in other places more heavily upon agriculture. The livestock (especially cattle) are kept for primarily wealth and ceremonial purposes, while the smaller stock contributes the greater portion of daily meat consumption. These societies are able to create and maintain a more balanced subsistence strategy that is both high in protein (meat and milk) and carbohydrates (grains, etc.) which benefits a population (Blench 1985: 6; Marshall 1990: 879; Smith 2005: 5-6).

The focus of this study site, Ndondondwane, probably fell more into the agro-pastoralist than pastoral mode based upon the preliminary study of the remains from the early excavations (Loubser 1993; Maggs 1984). The data from this thesis will test this proposition.

III. Cultural significance of domesticates

Throughout most types of pastoralism, many communities manage more than one species of domesticated animal and a hierarchy of domesticate species may develop. Specific animal species are given different values in each society. This section examines how the domesticated species of cattle, sheep and goats are generally regarded by herding societies in eastern and southern Africa.

A. Cattle

A majority of pastoralist groups within eastern and southern Africa regard cattle with greater importance than smaller domestic stock, such as sheep and goats. For example, the higher the number of cattle owned by a man is in direct correlation to his elevated status level within his community. Possession of large herds of cattle, usually regardless of overall herd health, will enhance a person's wealth, status and is a predictor of one's ability to fulfill any obligations for ritual and social requirements (Schneider 1979: 43).

A man with many cattle is wealthy, both in a secular and a ritual perspective. The person is able to provide food and milk to his family, accumulate status through acquiring wives for himself and his sons, and is able to provide cattle for ceremonial purposes. Therefore, cattle are closely entangled with all pastoralist social and cultural activities (economic, ritual, ceremonial, symbolic, etc), completely encompassing all aspects of a pastoralist culture (Mack et al. 1991: 111; Smith 2005: 28; Thorp 1995: 70).

Within certain pastoralist societies, cattle are such a central part of daily life that major household decisions are intertwined with how the livestock could benefit. For example, a study conducted on Zulu homesteads and settlement patterns found that when selecting a location to construct a new homestead, the patriarch would determine the best place to build the cattle kraal. The rest of the homestead construction would follow. Thus, the human living quarters were secondary to that of the cattle (Hall 1984b: 76; Mack et al. 1991: 93).

Cattle are almost never consumed as a daily meat source, but are only slaughtered during ceremonial or celebratory occasions, for example, marriage ceremonies, funerals and important rituals such as naming ceremonies, rainmaking and rites of passage (Dahl and Hjort 1976: 265; Rada and Dyson-Hudson 1970: 110; Ryan 2005: 99; Smith 2005: 28). The meat is then shared within the community. With enough of these types of rituals, the community has access to some meat at all times over the entire year. This is especially important within cultures where meat storage is not feasible or possible, as in most traditional pastoralist societies in southern and eastern Africa (Dahl and Hjort 1976: 265; Ryan et al. 1996: 748). A good example of this pattern is found amongst the Shona culture of Zimbabwe. Some of their ceremonial practices that require the slaughtering of cattle include:

(1) the ritual sacrifice of cattle (usually a bull) provided to a mother whose daughter is about to be married; (2) the conclusion of a burial service as the mourners return to the village; (3) during a wedding ceremony; (4) an important and respected person visits a village; and (5) other important ceremonies such as the installation of a new village chief (Gelfand 1971: 126-127; Thorp 1995: 71).

The Venda culture in northern South Africa follows the belief that only royalty may own cattle – thus the wealth, power and status remain in the confines of the upper class. Without cattle, the common person can only pay a bride price with small stock and tools, therefore eliminating any opportunity for a commoner to afford a wife with royal blood (Hall 1998: 92; Huffman 1986: 304). This is taken even further among the Tswana of South Africa, where the chief is seen as the supreme herdsman who oversees all cattle herds within his territory (both realistically and symbolically). The chief will possess his own herds, while maintaining herds of the office which are cattle confiscated by fines or taxes. The chief may also levy cattle from his subjects if the necessity arises. The chief must be cautious in his herding ability, because if the subjects are not content with his actions, they may move their herds to an alternate nearby chiefdom (Reid 1996: 45).

Cattle are basically considered as currency, while caprines (sheep and goats) are not. Cattle also act as a mobile "insurance policy" against major drought or other catastrophic events, where they are consumed as a meat supply when necessary. For example, the Maasai of Kenya maintain their cattle herds for the purpose of maximizing herd growth for wealth and as a food security in case of drought or disease. Primary and secondary products exploitation such as meat, milk and blood are a lesser concern (Ryan et al., 1996: 745).

Overall, a man who retains ownership of a herd of cattle wields a higher status. He is considered a man of wealth and is able to take wives. The larger the herd, the more wives the man can marry. Subsequently, the man then has rights to their children, who in turn participate in the increased production of agriculture and the tending of the herds (Dahl and Hjort 1976: 29; Reid 1996: 45).

B. Caprines (Sheep and Goats)

Caprines are considered a less important livestock. They are viewed as greatly inferior to the cattle herds. They are less likely to be kraaled with cattle, and caprine kraals are constructed separately from cattle and from the gathering places of men, occasionally completely outside of the main compound. They are primarily exploited as day-to-day meat sources due to the lesser stature they carry as well as a lesser economic investment compared to that of cattle. For example, caprine herds grow at a rate of three times that of cattle herds, thus the turnover rate reflects the faster growth rate of caprines (Dahl and Hjort 1976: 268; Mack et al. 1991: 88-90; Marshall 1990: 877; Schneider 1979: 44; Voigt 1986: 18).

With the Zulu, Sotho and Tswana of eastern South Africa, caprines alone are not considered as a symbol of wealth, but are only included with cattle when it is necessary to attain a level of prosperity (Beukes 2000: 33).Caprines are priced much lower than cattle. For example, within East African cultures, a cow may be worth between five and ten sheep or goats during an exchange (Schneider 1979: 44).

When herded in a mixed stock strategy where both sheep and goats are present, each contributes greatly to optimal herding practices. The benefit for herding goats is that they lead the herd to the grazing areas, while sheep keep the flock together at all times during grazing (Dahl and Hjort 1976: 269).

C. Sheep

Although sheep are held as lesser stock when compared to cattle, they are considered slightly more valuable than goats and have been known to be slaughtered at a lower rate than goats for daily meat consumption (Schneider 1979: 44). Amongst the Pedi culture of eastern Africa, sheep have been slaughtered on ceremonial occasions and to fulfill social obligations, but goats are most likely killed for daily meat (Beukes 2000: 34; Schneider 1979: 44-45; Quin 1959: 101).

D. Goats

Goats are considered to be lower in status and value than sheep and are therefore more prone to be slaughtered for food on a day-to-day basis (Schneider 1979: 44). Goats are known to be more resilient during periods of poor environmental conditions, such as drought, over that of both sheep and cattle (Bryant 1967: 339). Thus larger numbers of goats may be present within a society during times of environmental stresses. They are also more adept to thriving in extreme geographic regions, such as mountain ranges. For example, historically, they were reported to exist in "swarms" along the undulating coast of KZN in 17th century naval logs (Bryant 1967: 339).

IV. Primary and secondary animal products exploited by herders

The maintenance of domesticated livestock creates the basis for a specialized subsistence economy and focused animal product exploitation. Primary animal products utilized by southern African populations consist of meat, hide, sinew and bone. Secondary products exploited comprise mainly milk, but include blood, wool, dung, transportation and traction (Greenfield 2005: 14).

A. Use of primary products by herders

Primary products can only be extracted from the animal at or immediately after time of death. These products are only extracted once in the lifetime of the individual animal. Slaughtered animals provide the primary products of meat, hide, sinew and bone. Certain cultures also harvest all of the blood during the kill (Dahl and Hjort 1976: 175; Greenfield 2005: 14; Schneider 1979: 82).

1. Primary products - meat

If domestic herds are raised solely for meat purposes, the animals are normally culled at a younger age. With cattle, for example, the same amount of food would be required to raise seven calves for two years or three calves for three and a half years; furthermore, the former strategy produces over 40 percent more meat than the latter. Therefore, it is most optimal to butcher the cattle prior to two years of age, preserving mainly the breeding-aged females and a few breeding males. For the contingency of dire circumstances, a few adult males may be kept as a future meat supply, but are usually castrated at a young age (Dahl and Hjort 1976: 143; Greenfield 1988: 576; Lotka 1956: 120-136; Sherratt 1981: 283-284). The castrated males grow larger and are more docile. With caprines (sheep and goats), culling occurs at later stages of development in order to gain the optimal amount of meat weight possible prior to death (Marshall 1990: 878; Schneider 1979: 87).

Often in eastern and southern African cultures, the cattle are rarely killed for individual family use alone or for a daily diet. Freshly killed cattle meat is normally distributed throughout the community, creating an inter-site exchange system. Furthermore, due to the inability to adequately preserve meat (lack of refrigeration), this is the most efficient and logical process to utilize the animal to prevent spoilage and wastage of valuable meat. This in turn creates numerous obligations to reciprocate within the community, guaranteeing the initiating family food for a period of time. It also assists in the promotion of cooperation and solidarity within and occasionally outside of a community. Due to the importance of cattle in southeastern Africa, the slaughter of an animal is usually for a ritual occasion so that its death serves multiple purposes. It feeds both the ceremonial needs of a community as well as the people themselves.

Caprines, as mentioned above, serve as a daily meat source. Along with cattle, caprine meat is rich in fat which is a valuable product not readily available in most wild game in southeastern Africa (Smith 2005: 28).

2. Primary products - hides

The hides from slaughtered domesticated animals are can be as clothing, bedding and blankets. For example, the Zulu used lamb skins for men's clothing. The younger animals provided a soft glossy skin that was found most comfortable (Bryant 1967: 341; Ryan 2005: 99).

Also amongst the Zulu, cattle hides were widely used as war shield covers. Specific armies (*impis* or *amabutho*) were identified by the same coloration and patterning of cattle hides on their shields (Smith 2005: 14).

3. Primary products – bone and sinew

Bone products usually consist of long bone modification into tools and household items, such as: long bones as awls and points; scapulae as farming hoes. Divination kits by Witchdoctors contain astragali and/or phalanges from small to medium sized mammals as well as elements from an assortment of non-mammalian species, for example, frogs, chicken, tortoise and various shells (Plug 1987: 53-58; Thorp 1995: 60). Archaeological evidence of a divination kit would demonstrate unusual wear on such elements as well as the presence of a wear polish on the bones. Occasionally, bone is modified into adornment pieces (see chapter 6). Hippopotamus and elephant ivory are highly popular for use as both tools and adornment.

Sinew is quite strong, waterproof and very durable. Sinew is primarily collected from two areas of the animal: (1) along the spine or loin and, (2) the back of the lower legs (known as the Achilles tendon). The sinew along the spine is thinner while the leg sinew is quite robust. It is harvested for use as thread for clothing and textiles manufacturing, or to plainly "lash" objects together. The creation and utilization of bows require sinew from larger mammals, such as cattle or larger antelope, due to the need of thicker and longer segments of the product (Hamm 1989: 52).

4. Primary products – marrow

White bone marrow supplies a rich source of a highly sought after quality, fat, that provides an elevated level of energy and caloric potential when compared to other food sources (carbohydrates and proteins) including meat. This marrow is available from all mammals, but is especially rich in larger mammals such as cattle. The amount of marrow present will vary between each animal depending on sex, age, size and overall health. (Karr et al. 2005: 4-6; Ryan 2005: 99).

Bone marrow is most abundant within long bone shafts and medullary cavities. Access to the marrow is obtained by smashing through the thick bone of the shaft and scraping out the interior, or roasting the complete element over hot coals or open fire, fracturing open the shaft and pouring out the warm liquid. Marrow will be in more plentiful quantities during the rainy seasons and lessen during drier times or droughts. The marrow fat yields are also typically higher in adults than from juveniles (Karr et al. 2005: 4-7; Ryan 2005: 99).

5. Primary products - other

Cattle tails are also utilized after the death of the animal. They are used as fly whisks, especially important during the dry seasons when insects are more numerous and most bothersome. Cattle tails have also been known to be worn on clothing as adornment (Ryan 2005: 100).

B. Use of secondary products by herders

Secondary products are those that can be extracted multiple times over the lifespan of the individual animal. Secondary products from livestock, especially cattle, allow the community to lessen their workload, provide products and/or gain nutrition from their animals without killing them (Greenfield 1988: 573; 2005: 14).

These products include milk and milk by-products, blood, wool, dung, transportation and traction (Greenfield 1988: 573; 2005: 14; Sherratt 1981: 261-263).

1. Secondary products - milk

Numerous eastern African herding societies commit a high percentage of their overall diet towards the consumption of milk (Marshall 1990: 887). When milking is considered this important to a society, then the herd will be too valuable a resource to slaughter for daily meat (Sherratt 1981: 275).

A study conducted in Nigeria on milk yield production determined that a household with a cattle herd of forty would possess an average of nine lactating cows per year. An average milk yield is f 0.7kg of milk per cow per day which would amount to approximately 6 kg of milk each day, if conditions are optimal (Waters-Bayer 1986: 5).

Milk provides high amounts of fat, protein (particularly the amino acid lycine), sugar, and calcium. It is a renewable resource that is transportable and can be stored in containers for a brief time (Sherratt 1981: 276-277). Cattle milk production is most abundant during the rainy seasons (January to June) when forage is most readily available and the health of the herd is normally at its optimum. The fat content of the milk during the wet season may become twice that of the dry season (Marshall 1990: 887; Voigt 1986: 18-19). Although milk is normally consumed fresh, it can be soured or fermented to preserve it for a short duration. It is also boiled with tea or mixed with grains to make porridge (Ryan 2005: 99).

2. Secondary products – wool

The sheep present throughout southeastern Africa during the Iron Age consisted of the hairy variety and not the woolly species (Greenfield 2005: 15). The latter species was introduced during the migration of European settlers and traders within the last three centuries. Therefore, the exploitation of wool as a secondary product has no relevance to this research.

3. Secondary products - blood

In East Africa, cattle herding societies also bleed their animals. Among certain pastoral cultures, the blood and milk from their cattle are the primary source of nutrition. The blood can be mixed with fresh milk to make a protein rich drink. It is a constant renewable resource that is extracted in limited amounts over a long period of time and will provide essential nutrients especially during the dry season where milk is in low production. The blood can also be collected in abundance during the slaughtering of the animal (Dahl and Hjort 1976: 265; Rada and Dyson-Hudson 1970: 107; Ryan 2005: 100). Agro-pastoralists do not depend on blood products to the same degree as pastoralists.

4. Secondary products – dung

Domesticated animal dung is collected to provide a surface coating for hut floors and storage pit lining. It is also utilized in the construction material of huts, while some cultures dry it to use as fuel for fires (Ryan 2005: 100).

5. Secondary products – transportation

Amongst the Venda culture, cattle have been exploited as transportation whereby they are ridden in a similar way as horses or camels (Voigt 1983: 65).

V. Culling patterns

Culling patterns of domestic herds are generally quite similar throughout southern Africa. The purpose of selected culling of herds is to ensure a continual desired herd growth in order to maintain a steady avenue of food production over a long period of time (Marshall 1990: 877). The recognized pattern of livestock culling is specific to the economic specialization of the community (primary products versus secondary products). If the community exploited their animals for purposes beyond just meat, then the herds would be held as more valuable and not slaughtered as young or often. The younger male population would be considered the "liquid" asset and culled at a higher rate than the breeding-age females (Payne 1973; Sherratt 1981: 275-276).

The economic viewpoint of herd exploitation contends with two main viewpoints: (1) the killing of young animals over old is economically viable; and (2) the overall growth rate of most animals decreases as the animal ages. Therefore, it would cost more to feed an adult animal for minimal additional weight gain (Hesse 1982: 405).

When milk is an essential part of the subsistence strategy, the culling pattern may focus on the majority of young males with some younger females. This reduces the competition for milk, and in context to the culling of a majority of the males, increases the opportunity for more breeding females in a herd (Marshall 1990: 877-878). Overall, the culling pattern for a milking based economy will focus on immature animals over that of older individuals at the optimum meat weight (Greenfield 2005: 19; Legge 2005: 10).

If a majority of livestock are culled at the later stages of their growth, the herd management strategy is likely concentrated on gaining the most optimal amount of meat possible (Greenfield 1988). This stratagem incorporates the castration of a majority of the males present in the herd. This creates large, fatter and more docile animals that are no longer in the breeding population, yet still a part of the herd (Schneider 1979: 87). Cultures that exploit livestock for meat over secondary products view the culling of younger animals as wasteful, because they have not reached their maximum meat weight (Reid 1996: 48).

Slaughter of livestock, especially cattle for ritual purposes will follow the culling stratagem that benefits the chosen economy of each society (Dahl and Hjort 1976: 22). The choice of animal for a ritual or ceremonial slaughter will likely be deeply immersed in how the removal of that animal will benefit both the society as well as the herd. So the culling pattern may coincide with the economy of the village, whether it is milk or meat based.

No matter what the livestock exploitation purposes of the culture is, herd growth retains the utmost importance and focus. The larger the herd size, the greater the opportunities for surviving droughts or environmental catastrophes. Therefore, according to Hjort and Dahl (1976: 265-266) and Schneider (1979: 62), only eight to ten percent of the herd is slaughtered annually. An additional eight percent per year may die from natural causes, providing more meat for the community.

VI. Herd maintenance

The primary goal for any herder is to maintain the health and size of the herd while feeding his family and/or community. To do so, the number of animals that are required to maintain long term continuous product exploitation from the herd must actually be considerably larger than the number of animals that are culled at a given period of time (Dahl and Hjort 1976: 17). In other words, the few animals that are exploited at any given moment are only a fraction of the true herd size needed to maintain a family or community over a long term.

The main question is: what is the optimal number of cattle required to maintain a pastoralist family? According to Dahl and Hjort (1976: 265-266), a “reference family” of an adult male, a pregnant female, two young children and two teenage children would require a minimum herd size of sixty-four cattle. This means a ratio of just over six cattle for one person could sustain a family. There is little allowance for drought or other extrinsic factors that could decimate a small herd and subsequently starve a family. It is also likely that sheep and goat herds are present as a supplement to the diet. Furthermore, (whether from small farming or exchange) a diet of agricultural products would contribute to the subsistence of the family, yet has not been included in the equation. Therefore, Dahl and Hjort's reference family economy is not a typical African domestic pattern.

A similar "reference family" study was conducted by Schneider (1979: 64), who determined that the optimal ratio would be ten cattle to each person during the wet season and up to one hundred cattle to each person during the dry season. The inflated ratio during the dry season would be due to the lack of milk production, where it would take between ten and fifteen lactating cows to sustain a single individual. However, Schneider did not allow for the possibility of blood exploitation during the drier times or the milking of sheep or goats as an option.

Both studies focused on the minimal number of cattle that could sustain a family during optimal conditions and without supplementation of agriculture or small stock. When these factors are included, the minimum number of cattle to person ratio will decrease, especially with the Schneider study. Conversely, the herd sizes may be larger than the studies provided due to a focus on building wealth and developing insurance against drought that most pastoralist societies attempt to follow (Reid 1996: 49).

Bonte and Galaty (1991: 6-7) proposed that true pastoralist societies such as the Maasai or Boran of East Africa actually require between ten and twenty cattle per person during optimal conditions. Conversely, agro-pastoralist societies such as the Dassanetch of East Africa may only average three or four cattle per person.

To properly maintain a herd and maximize herd growth, an appropriate male to female ratio must be retained. Too many males in a herd could be detrimental to the overall health and growth rate of the herd. With cattle, the majority of breeding cows should be allowed to survive throughout their reproductive age while only a few breeding males are required to sustain a herd. One healthy breeding bull can service between thirty and fifty cows (Dahl and Hjort 1976: 22, 29; Reid 1996: 49). More male stock may be kept in a herd than necessary for trade or other exchange purposes, creating alliances and trade networks. Breeding bulls are especially found to hold a higher value (Dahl and Hjort 1976: 29-30).

With caprines, a similar ratio of males to females is maintained. Although, a male goat reaches sexual maturity at an earlier stage and can service up to one hundred females in a herd. Culling patterns are also quite similar to that described above. More males are castrated at an earlier age and kept within the herd for longer periods of time (Dahl and Hjort 1976: 31-32, 88-90).

VII. Conclusion

This chapter presented an ethnographic literature review on modern and historic herding practices by pastoralist and agro-pastoralist societies from eastern and southern Africa. The purpose of this review is to establish a possible link between the herding management strategies by pastoralist societies from the nineteenth and twentieth centuries and the zooarchaeological evidence from the EIA at Ndondondwane.

The content of this chapter revealed the main forms of pastoralist societies within the study area consisted of nomadic and transhumant groups and demonstrated how agro-pastoralist societies differed from the pastoralist. Furthermore, this chapter showed the presence of a domesticated species hierarchy within most pastoralist and agro-pastoralist societies and that certain domesticate species play specific roles and hold cultural significance within each cultural group.

In sum, Schneider (1979) and Dahl and Hjort (1976) provided detailed examples and estimates on the minimum number of cattle a "reference family" may exploit in order to survive. They do not allow for extraneous actual circumstances where meat other than from cattle may contribute to their diet, as well as agricultural products. In actual fact, cattle are primarily raised for purposes other than food (social, ceremonial and religious based activities), whereas sheep and goats along with crops are exploited for consumption. Caprines are not allowed near the cattle kraal, where men congregate. The cattle kraal is a focus of male economic, ritual and political activities, which in turn are not associated with sheep or goats (Hall 1998: 92; Huffman 1986: 299).

The types and usages of primary and secondary products as well as culling patterns and herd maintenance and growth strategies were also presented. Both pastoral and agro-pastoral societies exploit their animals for their primary and secondary products. However, pastoral societies rely more heavily upon their stock and as a result more intensively exploit them for their secondary products – hence, the east African milking complex so aptly described by Schneider and others. Animals produced for meat are often sold for agricultural products and disappear out of the pastoral system. Agro-pastoralists exploit animals for both primary and secondary products. This differing pattern allows the formulation of a prediction that may be tested against the data from Ndondondwane. If the data conform more to a mixed livestock management strategy, then the inhabitants of the site were probably agro-pastoralists. If specialization in secondary products appears to be the norm, then they are likely pastoralists of some type (nomadic or transhumant). These issues will be further explored in the analysis chapter.

Chapter 4: The Study Area and Site - Ndondondwane

I. The study area: region

The area of study is located within the Republic of South Africa, situated south of the Saharan desert within Africa. The Republic of South Africa encompasses the entire southern tip of Africa, and is bordered to the north by the countries of (west to east) Namibia, Botswana, Zimbabwe and Mozambique, while completely circumventing the independent country of Lesotho and alongside Swaziland (bordering Mozambique) (Figure 1).

The site itself is situated within the lower basin of the Thukela River Valley, in the eastern province of KwaZulu-Natal (KZN) which faces the Indian Ocean. The nearest major population centers to the site are the inland city of Pietermaritzburg and the coastal city of Durban, both south of Ndondondwane (Figures1 & 2). The town of Ladysmith is located northwest of the site (Figure 2), while the small community of Eshowe is found almost directly east of Ndondondwane.

KwaZulu-Natal consists of four major physiographic regions that are interconnected by a series of deeply incised river valleys. The regions are as follows: lowland area along the coast; inter-fluvial zone; broken basin and ridge; and the escarpment/mountain zone, such as the Drakensberg Mountains (Greenfield and van Schalkwyk 2003: 125). KwaZulu–Natal undulates considerably, possessing severe topography throughout a majority of the province creating a great difficulty in traversing the countryside. The deeply cut river valleys produce a rain-shadow effect drastically limiting the amount of precipitation that falls on the valley floors (van Schalkwyk 1994/1995: 188; Maggs 1984a: 73; Hall 1984a: 224). The lower basin of the Thukela

River is the river valley, in particular that contains the EIA site selected for this thesis (Ndondondwane).

The lower Thukela basin is a sharply cut, deep valley containing a semi-arid (sub-tropical) environment, with an average precipitation of only between 450 and 800 millimetres annually (Maggs 1984a: 73; van Schalkwyk 1994/1995: 188). The majority of the annual rainfall occurs between the summer months of November and January, swelling the Thukela River to several times its normal winter size, occasionally creating an impasse for both human and animal traffic (Greenfield and van Schalkwyk pers. comm.). Conversely, the winter months of May to July generate a considerably drier environment that may reach almost drought-like conditions (Hall 1984a: 225).

The Thukela River is the largest river in KZN Province at over 500 kms in length. It originates from the Drakensberg mountain range, is created from the culmination of two other major river systems (the Orange and Vaal rivers), and flows through the centre of the province west to east, eventually emptying into the Indian Ocean. The Thukela is a perennial river, containing flowing water during all seasons and severe weather patterns, unlike many rivers and tributaries in its vicinity; for example, the Wosi River, a minor tributary off of the Thukela River (Figure 3) will only flow after heavy rainfall (van Schalkwyk 1994a: 67). Until the annexation of Zululand by the British in 1887, the Thukela River was a natural geographic border between the historic territories of Zululand and Natal (Maggs 1989).

Vegetation along the Thukela River and its minor tributaries consists mainly of *Sclerocarya-Acacia* treeveld and *Spirostachys* valley woodland (savanna-bushveld) with patches of sweetgrass dotting the area creating stable year round grazing sites for both natural and introduced animal species (Maggs 1984a: 73; 1984b: 197; Loubser 1993: 110; van Schalkwyk 1994/1995: 188; Plug and Voigt 1985).

The geology of the lower Thukela basin consists of "hornblendic schists and gneisses traversed by granite veins" (Loubser 1993: 110). Throughout the area are deposits of granite, titaniferous magnetite, micaceous white talc schist and copper, all resources necessary in iron manufacturing and the creation of other useful products for both local consumption and as a trade good (i.e. talc powder, Loubser 1993: 110; van Schalkwyk 1994a: 65; 1994/1995: 193).

The lower Thukela basin was an ideal environment for settlements to establish themselves during the later stage of the EIA (500-1100 AD). The large Thukela River was the major water source for the settlements; the savanna-bushveld vegetation provided timber and thatch for housing, fencing and fires; the deep pockets of fertile, non-leaching colluvial soils were well suited for dry land agriculture; while the patches of sweetgrass were adequate year round grazing sources for both domesticate and wild animals; and the mineral sources were local and plentiful for iron smelting and talc powder manufacturing (Maggs 1984b; van Schalkwyk 1994a; 1994b; 1994/95; Greenfield and van Schalkwyk 2003; Plug and Voigt 1985).

Selection of a study site from this region was highly appropriate due to the extensive research in the area generating an exceptionally well-defined EIA culture historic sequence with ceramic sub-phases that hold a tight temporal array through radiocarbon dating (van Schalkwyk et al. 1997: 61; Greenfield et al. 1997: 42; 2000: 6; 2005; Greenfield and van Schalkwyk 2003: 122; Greenfield and Miller 2004: 1512). According to van Schalkwyk et al. (1997: 61), "...this level of control is available in only a few other areas of the subcontinent". With two decades of directed Iron Age archaeological survey conducted in the region, the knowledge base of EIA settlements in the Thukela Valley is clearly defined, allowing for a more precise analysis of specific hypotheses to be accomplished.

II. The Site: Ndondondwane

Ndondondwane was first discovered in 1977 by Campbell Woolmore, a farmer and owner of the local Middle Drift trading store. Mr. Woolmore contacted the Natal Museum when he recognized fragments of ceramic resembling portions of the now famous Lydenburg masks amongst scattered pottery sherds and bones in a nearby cultivated field. He had recently learned about the Lydenburg masks at a public presentation on local cultural and archaeological finds (C. Woolmore pers. comm.; Maggs 1984a: 71; van Schalkwyk et al 1997: 63). Realization of the significance of Ndondondwane was later determined by Tim Maggs of the Natal Museum, who began excavation in 1978 (Maggs 1984a: 73-74).

At 200 m above sea level, Ndondondwane (28°53'S, 31°01'E) is located on a gentle sloping hillside along the eastern shore of the Thukela River between the confluences of the Wosi and Nsuze rivers (Figure 3). The site is situated within a patch of deep, red-brown, loamy, alkaline (colluvial) soil that is "stable, with a high base and nutrient status" (van Schalkwyk 1994:188), which is indicative of the appropriate conditions for dryland agriculture. Ndondondwane is surrounded by savanna-bushveld vegetation intermixed with areas of sweetgrass that follow the Thukela River's path through the floor of the lower basin. The Thukela River is the only perennial large body of water in the vicinity of Ndondondwane (Figure 3), creating a necessary resource for the grazing of domesticated animals, harvesting of available riverine flora and fauna, and allowance for sustaining a small settlement (Maggs 1984a: 73; 1984b; Maggs et al. 1986; Loubser 1993; van Schalkwyk 1994a; 1994/95: 188).

Ndondondwane received its name from the historic river crossing that once existed, approximately 200 m downstream (also known as Middle Drift). The crossing was likely used throughout prehistory. Due to changes in water currents and levels, the crossing is now a set of impassable rapids (Figure 3) (Maggs 1984a: 73; Loubser 1993: 110).

A. Chronology

Ndondondwane is an EIA homestead found to have existed at approximately AD 750 (Maggs 1984a: 78) through uncalibrated radiocarbon dating techniques, when calibrated, the dates of occupation fall between AD 879-892 (Greenfield and Miller 2004: 1512; Whitelaw and Moon 1996: 74). The overall estimated time period of occupation for the site consists of only approximately 50 years or less and as mentioned previously, spans merely a single ceramic phase (Greenfield et al. 1997: 51; van Schalkwyk et al. 1997: 74; Greenfield and van Schalkwyk 2003: 133). To have access to an intact single ceramic phase, short term occupation site which is relatively undisturbed (barring the recent historic agricultural intrusiveness), is an extremely rare occurrence in southern African Iron Age archaeology, within the confines of the Thukela Valley, and KZN Province (Greenfield et al. 1997: 51). The majority of EIA sites that are comparable to Ndondondwane in size and that are somewhat undisturbed possess multi-component occupations that may span centuries and several ceramic phases. This situation creates an integration of artifactual and cultural remains that muddle the interpretive qualities needed to comprehend specific site concerns, such as subsistence strategies from a particular time period.

B. Modern intrusion

The land directly surrounding Ndondondwane was not agriculturally utilized immediately prior to the time of excavation; it had been used in the recent past as agricultural farmland, with plough furrows still visible on the surface. Due to the soil disturbances from agricultural practices, Ndondondwane was covered with scrub and thorn bush which had to be cleared prior to the first year of excavation (H. Greenfield pers. comm. 1997), in the most dense areas a grader was used to scrape the surface (van Schalkwyk et al. 1997: 65). The subsequent years required minor clearing of new scrub growth prior to excavation. The site is also currently used as an open grazing ground for cattle, sheep and goats by the local Zulu population. The grazing animals were even present, and on occasion a hindrance during the 1995 to 1997 excavation campaigns co-directed by Dr. Haskel Greenfield and Len van Schalkwyk.

III. Previous research and excavations at Ndondondwane

Since Ndondondwane was first discovered in 1977, three separate archaeological projects have conducted intensive excavations and research on the site. Tim Maggs (1984a), representing the Natal Museum, initially broke ground in 1978, during which he conducted a brief excavation of the central part of the site. This was followed by Jannie Loubser (1993, 1998) who excavated from December 1982 through to May 1983, when he was seconded to the Natal Museum during his period of national service for the South African Defense Force. Most recently, Dr. Haskel Greenfield of the University of Manitoba, Canada, in collaboration with Len van Schalkwyk of the KwaZulu-Natal

Monuments Council directed both an extensive survey and intensive excavation campaign over a three year period of time (1995-1997), with a fourth year for analysis of all artifactual remains (1998). During this period, a number of new analytical techniques were applied to the study of the site. Since the completion of the last field season (1997), analysis of the remains has been ongoing and a number of reports published (Greenfield 1998; Greenfield et al. 1997, 2000; Greenfield and Miller 2004; Greenfield et al. 2005; van Schalkwyk et al. 1997). The final report is still in the process of being compiled (see Greenfield and van Schalkwyk section below).

The following first section briefly describes each archaeological campaign and what features were investigated, along with the significant artifacts uncovered. The second section places an accurate temporal sequence of events (developed by Greenfield and Miller (2004) in conjunction with the differing stratigraphic levels within each feature which links the entire site into three distinct phases during the short existence of Ndondondwane.

A. Tim Maggs, 1978

Tim Maggs conducted a brief test excavation at the site in April, 1978 (1984a). Maggs decided to excavate at Ndondondwane in order to assist in his two-fold research study of the EIA in the region: a) to elucidate the regional chronology by excavating from a series of briefly occupied sites and tying the ceramic seriation to a radiocarbon chronology and; b) to investigate EIA settlement and subsistence patterns (van Schalkwyk et al. 1997).

1. The Mound Area

Maggs identified a large grey coloured mound (approximately 25 m in diameter), covered with a dense concentration of surface finds, from which he excavated 44 square metres (in 2 x 2 metre squares) over a three week period. This particular midden, aptly named the Mound Area, held a wealth of artifactual remains. In particular, Maggs found sculptured ceramic fragments which were very similar to the famous Lydenburg Head ceramic masks, an artifact that was not yet known in the Thukela valley (Maggs 1984a: 85). This is one of the primary reasons why Loubser was sent to the valley and Ndondondwane by Maggs a few years later.

Maggs' conception of the stratigraphy of the Mound Area was relatively simple and straightforward (while it is now recognized to be more complex). It consisted of an upper plough zone over reddish coloured midden material mixed with grey and darker lenses with up to four superimposed lenses present in certain squares (Figure 6 for the cross-section profile of Maggs' excavated units C11 to I11) (Maggs 1984a: 75).

Maggs also identified a new variation in ceramic decoration, and named a new phase of the regional EIA chronology after the site of Ndondondwane, which became in effect the type site for this phase of the EIA. "It is related to Msuluzi Confluence, yet has sufficient differences to merit its own typological subdivision" (Maggs 1984a: 78). The new ceramic type was similar to sherds later found and identified from an EIA site excavated by Maggs in 1979 called Magogo (Zulu for Grandmother), in both time period and typology (Voigt 1984a; Maggs 1984a), and afterward was found to be common to the Thukela River valley (i.e. Wosi, Mamba - van Schalkwyk 1994a; 1994b) and elsewhere (Kwagandaganda - Whitelaw 1994) within KZN.

Maggs (1984a) based his Ndondondwane phase on the analysis of 43 pots and 46 bowls, all relatively complete, plus a number of diagnostic rim sherds. The decoration of the most characteristic pots usually consisted of the following characteristics:

one band of decoration (although, occasionally two or three bands are present) on the lower portion of the neck ending at the body of the vessel, with an undecorated band between the decoration and the lip;

motifs of the highest frequencies consist of hatching and cross-hatching;

corded bands of decoration are another commonly found form of decoration, but in lower frequencies;

decoration on the body of the pottery is generally non-existent with the exception of the occasional ladder-like formations, pendant triangles or shaped panels (Figure 7) and;

burnishing (smoothing and polishing of the body with a stone) is common on the exterior body of Ndondondwane pottery, occurring in either red ochre, black or uncoloured tones.

Other ceramics excavated by Maggs included the mask fragments mentioned previously (Figure 8). These hollow, highly fragmented sherds were difficult to identify, although some pieces were found to resemble "large eyes, horns and crocodile-like jaws on a scale which suggests that the complete objects were larger than any of the Lydenburg heads" (Maggs 1984a: 85). Also, solid miniature ceramic figurines were found, which have been interpreted as being indicative of ritual or religious activities, especially when found in association with the ceramic mask fragments (Figure 9).

The Mound Area contained an extremely high amount of culturally modified bone, shell and ivory, as well as zooarchaeological remains. Ivory wastage fragments from bangle (armband) manufacturing were found in copious amounts (1960 fragments were identified during the initial analysis – Voigt and von den Driesch 1984: 102) along with over 50 fragments of completed or nearly completed bangles (Voigt and von den Driesch 1984: 103). This magnitude of accumulation of ivory is considered quite rare for an EIA site of Ndondondwane's size and short period of occupation. Voigt and von den Driesch (1984), the zooarchaeologists who initially analyzed the assemblage, confirmed that due to the high volume of ivory wastage, the site was likely the location of a specialized, large scale ivory bangle manufacturing activity area.

Maggs surmised that the Mound Area was the focal point associated with the major activity areas of: (1) the specialized carving of bangles from ivory tusks and (2) ritual-orientated activities (due to the high number of ceramic mask fragments and figurines), and the presence of a compacted living floor demonstrated the presence of a structure. The Mound Area was also utilized as a dumping ground, accumulating a large amount of cultural debris over the short time of occupation (Maggs 1984a).

Voigt and von den Driesch's (1984) published zooarchaeological analysis of the Ndondondwane assemblage is included in the body of analysis of this thesis.

B. Jannie Loubser, 1982-1983

Jannie Loubser conducted intensive excavations at Ndondondwane between December 1982 and May 1983 owing to Maggs' recommendations that this was a rich site worthy of additional investigation. Furthermore, the site was under direct threat of destruction due to a proposed dam construction project affecting the Thukela river valley area. Loubser, under the employment of the South African Defense Force, excavated a majority of the Mound Area, and broke ground on two new areas of interest: the Dung Area (about 40 m north of the Mound Area); and the Daga Area (approximately 40 m southeast and upslope from the Mound Area) (see Figure 11). Overall, 208 square metres of deposits were excavated at Ndondondwane during this archaeological campaign (Loubser 1993; 1998).

1. The Mound Area

Due to the great volume of artifactual remains and features uncovered during the 1978 archaeological campaign, Loubser expanded the excavations at the Mound Area following the original grid instituted by Maggs (Maggs 1984a). He also retained the system of excavating in 2 x 2 m dug squares. Loubser reopened a majority of the squares excavated by Maggs in order to provide more of a comprehensible picture of the multitude of features present. He describes the presence of three major horizons, but a sequence of five culturally associated depositional layers was identified in this part of the site (Loubser 1993: 112-119).

Loubser's first objective was to corroborate the findings of Maggs (1984a). The hut floor was rediscovered and verified, it was found to be *in situ* and in association with the earliest level of deposit of the Mound Area. The floor was likely to be 12 m in circumference, and according to the amount of daga recovered, had a foundation wall of only 10 cm in thickness. The daga fragments held impressions of reed, thatch and string indicating the nature of construction materials used for the upper portion of the hut. Dense accumulations of daga were also discovered in the lowermost level at the southern end of the excavated area (G11) (Figure 9). This may have been indicative of a second hut floor (Loubser 1993: 115).

Amongst the artifactual remains (ceramics, bone and daga), Loubser located a large bowl-like depression lined with 20 cm of slag, a clear indication of an Iron Age furnace. A layer of hard-baked daga blocks, with slag, mica, and tuyere (forge) fragments were also found in the northern portion of the excavation zone. Overall, more than 500 kg of slag was recovered during this archaeological campaign (Greenfield and Miller 2004: 1528). The remains are irrefutably those of a smelting furnace, signifying that the Mound Area was also the location of the specialized activity of iron ore smelting.

The iron ore was assumed to have been mined from a "vanadiferous magnetite outcrop 6 km south of Ndondondwane" (Loubser 1993: 119) which is near the EIA site of Mamba (van Schalkwyk 1994b). This allegation was refuted by Greenfield and Miller (2004: 1531), who established that the ore arrived from a much closer source near the EIA site of Wosi within a half kilometre downriver of Ndondondwane (see Figure 3).

Apart from the large quantity of richly decorated ceramic pottery sherds excavated from the Mound Area, a number of ceremonial hollow mask fragments and figurines similar to those recovered by Maggs (1984a) were also unearthed. All ceremonial ceramic types (masks and figurines) were damaged prior to deposition, and were deposited in the layer between the Lower and Upper Horizons – i.e. in association with the ivory manufacturing level. Analysis of the mask fragments determined that there were likely four separate masks in existence. Uniquely decorated crocodile-like beak fragments, multiple and varied sized eyes and noses, presence and/or absence of teeth, and many solid ceramic horns, some resembling cattle and others antelope (Figure 10, left), were all indicators of more than one ceramic mask being at hand (Loubser 1993: 127-133). Besides the similarity to the masks from Lydenburg, the Ndondondwane mask fragments resembled fragments found at Wosi (van Schalkwyk 1994a: 82) and Magogo (Maggs and Ward 1984). Magogo also yielded clay figurines that were stylistically close to those from Ndondondwane (Figure 8). Although the stylized ceramic figurines continued through the LIA, little is known why the remnants of the hollow masks do not appear to exist after the EIA (Loubser 1993: 143-145).

Concerning the ceremonial aspects of the masks and figurines, Loubser surmises that they are in fact "initiation paraphernalia" for pubescent and/or marital ceremonies. These ceremonies are common throughout southern Africa, and historical and ethnographic research supports the archaeological evidence for this conclusion, for example the northeastern Sotho and Venda cultures.

"In these ceremonies male and female initiates…..are shown various sacred objects, including masked figures and clay and wooden models of abstract objects, animals and people. At the termination of these 'supplementary schools' the reed or grass masks and clay objects are either discarded or burnt" (Loubser 1993: 145-147).

2. The Dung Area

The Dung Area was aptly named due to the visible cluster of animal dung mixed with grey ash through the plough zone, and is located approximately 40 m north of the Mound Area (Figure 11 overall excavation plan). The accumulation of animal dung and ash delineated the feature as an EIA cattle enclosure otherwise known as a byre or kraal. Loubser reported that =approximately 112 square metres of the Dung Area was exposed in order to demarcate the extent of the deposit (Loubser 1993: 121-123; van Schalkwyk et al. 1997: 64).

Two separate levels of dung were discovered. The lower level was a hard packed, smooth layer of only 5 to 10 cm thickness and an overall diameter of 12 m, while the upper layer consisted of soft dung with an average depth of 10 to 25 cm and an estimated overall diameter of 14 m. A shallow channel was found to be dug into the western exterior edge of the hard dung level. Within the channel were intermittently spaced post holes, an indicator of fencing similar to what was identified at the Mound Area (Maggs 1984a). This was assumed to be a small stock enclosure (for sheep and/or goats). Evidence for the presence of a second byre in the Dung Area was the existence of double rows of larger post holes, some with wood fibres still present, found within the northern portion of the excavated zone (Loubser 1993: 122). The double rows of thicker posts may be indicative of the cattle area, where stronger palisades would be required to contain the larger animals.

The outer edges of the Dung Area consisted of concentrations of ash, ceramics and bone indicating that the exterior of the byre was used as a dumping ground. Included in the ceramics from the Dung Area was a mask fragment that actually fit into one of the partially reconstructed masks from the Mound Area (Loubser 1993: 129-130), demonstrating the contemporaneous usage of these two activity areas likely by the same few individuals

In summary, the Dung Area represented two temporally separate but overlapping byres, one more recent than the other, during the short period of occupation at Ndondondwane. From ethnoarchaeological research and preliminary analysis of the zooarchaeological assemblage, the inhabitants of the byres would likely have been cattle in the larger enclosure and sheep and goats in the smaller (Voigt and von den Driesch 1984). Further zooarchaeological information on the material from this area will be provided in the following chapters of this thesis.

3. The Daga Area

The Daga Area is located upslope and southeast of the Mound Area (see Figure 11), and was identified through surface finds of small piles of daga, ceramic sherds and lower grindstones. Through surface survey, Loubser established that daga stretched for over 200 m in a linear north to south pattern, signifying a possible row or arc of huts located upslope of the specialized activity areas of the Mound and Dung Areas. It is now recognized that it was not a continuous row of material, but three separate clusters, one of which is the Daga Area (aka Midden 2 – Greenfield et al. 1997, 2000). Only five 2 x 2 m squares were excavated, with one revealing a daga floor covered with pottery, bone, pole and thatch impressed daga, and flecks of charcoal. Over 30 litres of daga were recovered from the excavation of a trench, along with a concentration of lower grindstones, ceramics, and bone (Loubser 1993: 123). Loubser concluded that the artifactual remains from the Daga Area signified an area of living structures separate from the centralized specialized activity areas of the Dung and Mound Areas, and therefore a sector comprised solely of common EIA household activities (Loubser 1993: 123).

4. Significance

Overall, Loubser's expansion of Maggs' previous excavations at Ndondondwane identified that the site was quite complex, with centralized specialized activity areas and a separate and upslope line of living structures. The inhabitants may have practiced pubescent and/or pre-marital ceremonies that involved highly decorated hollow ceramic masks, and stylized solid clay figurines, both of which were discarded at relatively the same time (Loubser 1993).

The beginning of a pan-site chronology occurred through the matching of a single mask fragment from the upper level of soft dung in the Dung Area to the partially reconstructed mask in the Mound Area. Unfortunately, because of the inaccuracies of radiocarbon dating of the early 1980's, Loubser was not able to scientifically support this conclusion (Loubser 1993).

Due to unfortunate circumstances, Loubser was removed as field director and excavator of Ndondondwane by the South African Defense Force in the middle of the excavation season and replaced by an individual with much less field experience (Loubser 1993: 122). Therefore, he was unable to complete the high quality of work that he began. Even though excavations continued for several months, no adequate records were kept and gaps in the Ndondondwane archaeological record were created (van Schalkwyk et al. 1997). Greenfield and van Schalkwyk attempted to fill the gaps with their ensuing large scale archaeological investigation (see below).

The zooarchaeological assemblage from Loubser's excavations were located and analyzed in the McGregor Museum (Kimberly, Republic of South Africa) in 1998. The results are included in the body of analysis presented in this thesis. The available assemblage consists of mainly the Mound Area material, with a much smaller percentage of material from the Dung and Daga Areas. Approximately half of the material from the Dung Area in the McGregor Museum was not analyzed in 1998 since it did not have any stratigraphic context. These were from units excavated after Loubser left the field.

VI. Haskel Greenfield and Leonard van Schalkwyk Collaboration, 1995-1998

Haskel Greenfield and Len van Schalkwyk conducted a collaborative effort in an extensive four year program of excavation and analysis at Ndondondwane from 1995 to 1998 (Greenfield 1998; Greenfield et al. 1997, 2000; Greenfield et al. 2005; Greenfield and Miller 2004; Greenfield and van Schalkwyk 2003; van Schalkwyk et al. 1997).

The purpose of the latest phase of large-scale excavation by Greenfield and van Schalkwyk was to increase the understanding of the intra-settlement economic and social organization of the EIA communities in southern Africa, particularly the Thukela River valley, by testing spatial models of community organization at Ndondondwane (Greenfield et al. 1997, 2000; Greenfield et al. 2005; van Schalkwyk et al. 1997). Prior researchers presented contradictory models on EIA community organization. Huffman (1982; 1986a; 1986b; 1986c), Denbow (1984) and others observed EIA community organization at a community-wide mode of production (i.e. the Central Cattle Pattern), a concept introduced from the ethnographic record (cf. Kuper 1982). Conversely, Hall (1987) suggested that EIA communities followed a domestic or household mode of production. Greenfield and van Schalkwyk decided that an opportunity to provide clarification presented itself with Ndondondwane, while salvaging the highly valuable EIA site from possible heavy impact due to proposed damming of the Thukela River (van Schalkwyk et al. 1997).

From 1995 to 1997, Greenfield and van Schalkwyk initially expanded the excavations in the Dung and Daga Areas, and subsequently located other areas of interest at the site (van Schalkwyk et al. 1997; Greenfield et al. 1997). Complete analysis of all excavated material interspersed with excavation began in 1997, with the full analysis aspect continuing in 1998, 2000, 2003, 2004, and 2005. It included all materials found from the previous archaeological campaigns, in order to ensure that all was analyzed to a similar standard.

Greenfield and van Schalkwyk initiated a series of surface and subsurface reconnaissance techniques in order to establish the true boundaries of the site, locate hidden features and/or artifact concentrations, and to investigate and establish the spatial patterning at Ndondondwane. The concept of systematically applying a battery of research techniques to a single site was one that had never been utilized within the southern African region before. The battery of techniques consisted of: (1) topographic survey; (2) systematic surface scatter collection; (3) electrical conductivity survey; and (4) soil auguring (Greenfield et al. 2000). The removal of overgrowth of vegetation and soil overburden by a road grader in 1995 and the surface collection revealed that Ndondondwane was a much larger, and more complex and intact site than initially conceived. Exposure of artifacts by the grader and subsequent ploughing allowed for the team to initiate a systematic surface collection of artifacts over the entire surface of the site in order to locate the artifactual concentrations and thus establish the potential location of new activity areas for excavation (van Schalkwyk et al. 1997: 65; Greenfield et al. 1997: 45-46; 2000). Two types of surface collection areas occurred: scrapes and ploughed areas. The Scrape areas are numbered on Figure 11, while the rest of the area was ploughed during recent agricultural activities.

When the surface scatter finds were analyzed, the extent of the middens and boundaries of the site could be better understood. Through this method, an unknown Midden (provisionally named Midden 4, but now recognized as the southern end of the

Midden 2 (Daga Area) was discovered by pursuing a trailing line of debris south from the main Midden 2 area (see Surface Concentration southeast of the Mound Area in Feature 11). It also became apparent that the centralized activity zones of the Dung and Mound Areas were composed of a single large area encompassing and masking a hut floor discovered in Transect 2 (see below). The ceramic surface finds were provenanced and provided a resultant ceramic density contour map that demonstrated a relative consistency with the other survey techniques and excavation results.

The barrage of reconnaissance techniques, such as the electromagnetic ground conductivity (EMGC) and auguring surveys, applied to the site enabled the identification of zones of "empty space" at Ndondondwane. These are areas within the site that were totally devoid of artifactual or feature remains. This enabled the delineation of boundaries between activity areas (i.e., centralized versus periphery) as well as locating the true boundaries around domestic middens and other features (Greenfield et al. 2000).

Greenfield et al. (2000) concluded that due to the application of a multi-faceted surface and subsurface reconnaissance process. A greater understanding of the knowledge and comprehension of various activity areas and overall use of the site occurred while limiting the formation of any misleading conclusions that use of any single technique may have created (Greenfield et al. 2000; Greenfield and van Schalkwyk 2003). The application of the barrage method of surface and subsurface reconnaissance proved extremely valuable in using the test results to concentrate on certain areas for excavation while being able to disregard others, thus maximizing efforts in order to sufficiently answer the particular hypotheses of the researcher(s), (i.e., EIA intra-settlement spatial organization).

1. The Dung Area

One of the primary areas of excavation in 1995-1996 focused on expanding Loubser's work on the Dung Area. The team unearthed a further 140 square metres in this area, entirely removing the north, west and southern perimeter. Some areas of the eastern periphery were excavated in 1997.

A number of features were found during the course of excavation of the Dung Area, including: hearths (associated with the cooking of meat); iron-forging areas; and a ceremonial burial of a complete pot at the entrance of the byre. A small depression was found in the south section of the byre containing a single centralized post-hole. A large amount of bone and ceramics were recovered from the southern to south eastern byre area. The majority of ceramics excavated were of eating and drinking vessels, not used for the purpose of cooking (Fowler 2002). An interesting observation was that the bone and ceramics removed from the basin area did not exhibit a high degree of fracture, indicative of a lack of post-depositional trampling, unlike the remaining areas of the byre (van Schalkwyk et al. 1997; Greenfield et al. 1997).

2. Transect 1

Investigations into an area of empty space (Loubser 1993:121) located between the Mound Area and Dung Area revealed an entire burnt daga hut floor (Figure 12). The circular floor was uncovered at a depth of 115-120 cm and was found to be associated with a thick ash deposit, numerous flat lower and rounded upper grinding stones, a large flat sharpening stone, large quantities of ceramics (including six complete vessels) and bone. The floor contained evidence of a ring of postholes on its periphery with a single large posthole in the centre, there were also reed impressed burnt daga throughout. The excavated "sterile" area was designated Transect 1 (van Schalkwyk et al. 1997; Greenfield et al. 1997).

It was determined that the thatch hut burnt down onto the daga floor with such intense heat that it baked the daga solid, thus preserving it for well over one thousand years. The fire was likely to have occurred unexpectedly and spread rapidly due to the number of preserved *in situ* artifacts found directly on the floor surface. The hut burned down and was subsequently abandoned as is. Due to the expectation of standard directional seasonal prevailing winds and the knowledge that the burnt hut's unidirectional ash deposits located at north and northwest edges of the floor, it could be deduced that the hut burned down in the winter months with prevailing winds from the southeast at that time (van Schalkwyk et al. 1997).

The function of the hut was initially proposed as a possible men's or shaman's hut. Based on the proximity of the hut to the cattle byre and iron working areas, and distance from the other living structures, it was initially concluded that this hut was strictly a male activity area (Greenfield et al 1997; van Schalkwyk et al. 1997). However, the ceramic analysis would indicate that it should be considered a domestic residence, given that the ceramics included food preparation, consumption and short-term storage (Fowler 2002).

The burnt daga floor from Transect 1 is the largest and best preserved EIA hut floor in all of southern Africa. After the completion of the analysis and recording, the floor was left with all artifacts *in situ*, and carefully reburied for future considerations of research and/or the development and construction of an on site museum (van Schalkwyk et al. 1997).

3. Charcoal Preparation Area

Originally named the Furnace 1 or Pre-smelting Area (Figure 11), the Charcoal Preparation Area was discovered in 1995 and had evidence of a cultural horizon which had been exposed to long-term high temperature burning. Due to ploughing activities in this area and subsequent down slope erosion, most of the deposit and artifactual remains were uncovered within the plough zone. A thin cultural horizon was preserved below. The deposit was characterized by a substantial amount of large charcoal fragments and burnt daga embedded within an extensive (>10 m in diameter) burnt soil horizon. Distributed on the surface were large hammer stone cobbles and small residual raw iron ore fragments of a low-grade nature (such as substantial inclusions of nonferrous impurities). In the excavated area, a small basin was found dug into the substrate. The basin and the surrounding area were likely the central point of a charcoal preparation area, probably to produce large quantities of charcoal for the production of iron. Raw iron ore was probably broken up in anticipation of smelting in this area, due to the presence of hammer stones and raw ore fragments (van Schalkwyk et al. 1997; Greenfield and van Schalkwyk 2003). In contrast, Fowler (2002) has hypothesized, based on ceramic analysis, that the area may have been used as a ceramic firing area.

The low occurrence of ceramic vessels and zooarchaeological remains indicate that the area was utilized solely as a specialized activity zone(s), and not for any domestic activities such as food preparation and cooking (van Schalkwyk et al. 1997; Greenfield and van Schalkwyk 2003).

4. Midden 1

Initially located through pedestrian survey and confirmed by grader scraping and surface scatter collection in 1995, excavations at Midden 1 (Figure 11) revealed a plethora of unique and significant features. The features are as follows:

(1) An ash midden was located within the southern portion of Midden 1, likely an accumulation of hearth sweepings deposited into an intentionally dug out basin.

(2) Subsequent horizontal excavations outward from the ash midden uncovered three storage pits. Each was dung-lined and most likely initially was used for grain storage. The lining of pits with a protective layer of dung is a common means of protecting the harvested grain (e.g. sorghum) from being contaminated by moisture from the surrounding soil. The final use of the pits was as refuse pits (Pits 1 and 2), following the abandonment of the site:

Pit 1 was the deepest pit of the three and was refilled with a modest amount of debris (broken upper and lower grindstones, small fragments of ceramics and bone and ash). It was left open for a long period of time and was gradually filled.

Pit 2 was considerably shallower and was filled with a different assortment of domestic associated cultural remains than in Pit 1. When it was no longer in use as a storage pit, it became the major dumping ground for upper and lower grindstones from throughout the site. Prior to dumping of the grinding stones into the pit, four complete cow bones were arranged in the shape of a cruciform pattern in the base of the pit. It has been surmised that the purposeful placement of these bones was ritually set to signify a new stage of use for the pit. A large frequency of ceramic and bone fragments were intermixed with ash filling the cavities between the stones. The pit was covered with several large stones that acted as a cap or lid, usually signifying the pit was abandoned with the contents intact or to protect special goods (Greenfield et al. 1997; van Schalkwyk et al. 1997; Greenfield and van Schalkwyk 2003). Based on the ceramic seriation, Greenfield et al. (2005) concluded that Pit 2 was filled with almost all of the upper and lower grindstones from Ndondondwane immediately prior to complete abandonment of the settlement.

Pit 3 was the shallowest of the three pits and contained zooarchaeological remains, ash and large fragments of ceramic vessels, along with a large, complete inverted ceramic pot that contained the remains of a fully articulated 3 month old human infant, (Figure 13). The infant was discovered face down within the inverted pot, meaning that the infant would have been placed in the pot on its back. Very little else was excavated in the upper horizon, indicating that this particular layer was dedicated solely for the burial of the infant (Greenfield et al. 1997; van Schalkwyk et al. 1997; Greenfield and van Schalkwyk 2003).

(3) Within the midden, evidence was found for the presence of an iron forging activity area (Figure 14). It was identified by the presence of a concentration (0.5 x 0.7 m) of burnt soil, charcoal, ash and slag (Greenfield and van Schalkwyk 2003).

(4) An unfired clay hut floor with a hearth was uncovered south of the main midden area. The daga floor possessed an especially thin compacted living layer, and had very little artifactual remains in association with it (Greenfield and van Schalkwyk 2003).

In summary, the ash deposits throughout Midden 1 may indicate the existence of the female role orientated series of domestic activities, including food preparation (i.e. cooking), food (grain) storage, ceramic production (pottery firing), and cleaning of ash and refuse from these activities and their dumping in a circumscribed midden area to the north of the hut area, in proximity to the storage pits. Furthermore, more sexually ambiguous activities, such as the repairing of metal tools (forging), also took place in the area.

5. Midden 2 (The Daga Area)

Following Loubser's discovery of and conclusion that the Daga Area was likely the remains of a series of plough impacted hut floors (Loubser 1993), the 1995 team pursued aggressive test trenching (175 m^2) over a 500 m^2 area within the highest density of surface finds (including the excavated region of Loubser). The only relatively *in situ* feature uncovered was a small ash deposit mixed with ceramics, bone and shell disc-beads (*Acatina sp.* - large land snail). Although there existed only a small cultural horizon below the plough zone, no indications of any artifact scatter, hut floors or other domicile oriented features were found, even through more test trenching, coring and grader scraping over the region (Scrape 1 and 2, Test Trench 2 {Figure 11}) (van Schalkwyk et al. 1997; Greenfield et al. 1997).

Concentrations of daga (possible remains of above ground granaries), a daga floor of a hut with associated hearth, and a number of ash deposits were all features heavily affected by plough scarring in Midden 2. Overall, the midden was not deep, but extensive. Midden 2 interpreted as domestic activity area, and was contemporaneous with Midden 1 and Midden 3 (Figure 11) (Greenfield and van Schalkwyk 2003). Domestic activities and domestic associated areas are almost always considered interconnected with female roles situated on the periphery of the settlement, while male roles appear more centralized and are associated with iron smelting and forging, livestock especially cattle herding and ivory bangle manufacturing.

6. Midden 3

Midden 3 (Figure 11), also known as the Ivory Midden (from the 1995 surface find of a hippopotamus canine tooth fragment), contained the remains of a plough damaged daga hut floor, a grain storage pit that was dung lined, and numerous clusters of artifact deposits including grind stones, ceramics and bone (van Schalkwyk et al. 1997; Greenfield and van Schalkwyk 2003). The midden was horizontally dispersed with very little vertical depth (Figure 15). It was almost entirely incorporated into the plough zone.

7. Significance

The Greenfield and van Schalkwyk research team was able to develop an accurate temporal sequence of events through analysis of stratigraphic layers throughout Ndondondwane. This was possible due to the barrage of surface and subsurface surveys conducted, followed by focused intensive and extensive excavations, a practical application that had never before been utilized in southern African site of this period. This strategy proved quite valuable to answer questions related to the spatial organization of activities and how they change over time.

In the course of all the research applied by Greenfield and van Schalkwyk, the question of the spatial organization of the site was determined. When the site reached its phase of greatest expansion (Middle Pan Site Horizon), there is a clear separation between central and peripheral domestic activity areas. The Mound and Dung Areas are the centrally located activity areas at Ndondondwane, and the domestic activity areas such as the three middens formulate an outer periphery. All domestic activity areas appear to be associated with the peripheral middens. They are located within a relatively similar distance (ca. 60 m) from the Dung Area. Analysis of this "open space" has been interpreted as being the locus of gardens and fields for domesticated cereal crops. They were planted between the central activity area and the outer arc of domestic activity areas probably to protect the crops from destruction by birds, hippopotami and elephants (Greenfield et al. 2005).

Clearly, newer models need to be generated to explain the patterns seen in the archaeological record as a result of Greenfield and van Schalkwyk's research,. According to Greenfield et al. (2003: 134), Ndondondwane demonstrated an "interplay of activity features which suggests that EIA culture was organized in a fundamentally different manner than during the LIA and ethnographic present". The use of domesticated animals appeared communal, yet the storage of grain seems to be associated with individual huts. Although the archaeological investigations at Ndondondwane have presented numerous breakthroughs in the comprehension of EIA culture, further research is necessary to fully clarify the true nature of socio-economic organization.

The evidence indicates that Ndondondwane at its most expansive was a well organized community possessing two distinct specialized activity areas: (1) a centralized area with what are considered to be traditional male orientated activities (livestock herding, ivory bangle manufacturing, male oriented ceremonial events); and (2) a partially encircling arc of domestic activity areas containing living structures, grain storage facilities, burial grounds (with infant burial), and middens. However, this was not the pattern in all of the phases of occupation. In the earliest horizon (Lower), only the central area was occupied and it contained both domestic and public activities. In the last horizon (Upper), the site is abandoned and it is used as an iron smelting locus by inhabitants from a neighbouring village/homestead (Figure 16).

VII. Temporal Placement of Activities

The following section provides a unique insight on the inception and utilization of each specific activity area at Ndondondwane with temporal affiliation. This is accomplished through the association of three minute stratigraphic soil changes (Lower, Middle and Upper Horizons) that span the entire site. Thus allowing us a rare comprehension of what sequence of events took place when Ndondondwane was occupied, what and when the development of activity areas occurred, and whether or not Ndondondwane was abandoned outright.

A. Lower Horizon

The oldest horizon represents the primary habitation of Ndondondwane. The first structures consisted of a hut floor in the Mound Area, the large burnt hut floor from Transect 1 and initial livestock kraal creation and iron forging in the Dung Area. No other areas of the site were occupied or utilized at this time (Greenfield and Miller 2004: 1514-1515).

B. Middle Horizon

The Middle Horizon signifies the peak of occupation at Ndondondwane. Middens 1, 2 and 3 representing the Domestic Areas were in full use, including the corresponding hut floors and grain pits. Iron forging was continuing at the Dung Area as well as an expansion of the kraal fencing. A second livestock enclosure was built within the confines of the Mound Area as well. Furthermore, the Mound Area was the site of a series of activities; including initiation rites (Loubser 1993) and ivory bangle manufacture (Greenfield and Miller 2004: 1514-1515).

C. Upper Horizon

This last horizon represents the abandonment of the site and its reuse as a smelting site. A large ash dump was created in the center of the Dung Area. The upper and lower grindstones from the Middle Horizon are gathered and placed in Pit 2 of Midden 1. At the same time, the infant was likely buried in Pit 3. A very short time after abandonment (at most a few years), the site is revisited and a section of the Mound Area is utilized for iron smelting – the smelting furnace and slag pit. The Charcoal Preparation Area is where the charcoal is prepared for the smelt (Greenfield and Miller 2004: 1514-1515).

D. Summary

Greenfield and Miller (2004) were able to determine that all three temporal horizons remained within the Ndondondwane ceramic phase; although a slight stylistic variation was found to be present. They also discovered that although some time passed between the Lower and Middle Horizons, there was almost no difference in time between the Middle and Upper Horizons (Greenfield and Miller 2004: 1515).

This is an extremely rare event to be able to segregate three separate temporal phases within such a small period of occupation and to comprehend the actual sequence of events that took place during the occupation, use and abandonment of an EIA site in southern Africa.

The Upper Horizon represented the abandonment of the site. This event was marked by destruction of the structures, fragmentation of all grind stones and infilling of all storage pits with debris. It would seem that any non-portable items were systematically destroyed and purposely deposited. A probable reason behind the rapid abandonment of Ndondondwane was the death of the headman of the homestead. Traditional cultural traditions in the region today, mandate that the homestead be abandoned when the father or headman dies (van Schalkwyk personal communication).

VIII. Conclusion

Through three separate intensive archaeological projects at Ndondondwane came increasing realization of the uniqueness of this site. Ndondondwane was a rare type of site that was particularly useful for increasing our understanding of spatial activities in the EIA. It had a short term occupation (<50 years), was characterized by a single ceramic phase, in an area with tight ceramic chronological controls.

The opportunity to investigate such a site allowed the researchers to develop and test specific hypotheses of which had not been applied to an EIA site previously. The interpretations of these findings have been outlined in this chapter, while others are still in the process of being deciphered.

The wealth of artifactual remains, in accordance with the plethora of valuable archaeological site attributes (i.e.) a relatively undisturbed, single ceramic phase EIA southern African site with an occupancy of less than 50 years (essentially a snapshot of history), produces a designation of rarity on Ndondondwane. The opportunity to examine the zooarchaeological remains of this site in order to determine the subsistence strategies of the EIA settlement is one of great honour. Numerous researchers have utilized data from Ndondondwane to strengthen and/or test models or theories on Iron Age archaeology, especially EIA archaeology in the Thukela River Valley; therefore, it is necessary to establish a strong precedence on zooarchaeological applications towards the determination of a concise subsistence strategy for this archaeologically important site.

Spatially, Ndondondwane possesses what appears to be an outer arc of domestic activity areas consisting of living structures or huts with middens and storage pits, surrounding a centralized activity area containing the cattle byre(s) (also known as a kraal), a large burnt daga hut floor, and specialized activity areas for iron smelting, ivory bangle carving and ritual occurrences (Greenfield et al. 1997; 2000; van Schalkwyk et al. 1997; Fowler et al. 2000; Greenfield and van Schalkwyk 2003) (Figure 9).

Ndondondwane is a complex EIA site with all of its major features and activity areas found relatively intact. The sequence of events that took place from the inception of the site to its abandonment is a rare glimpse into the activities of an EIA society.

Chapter 5: Methods

I. Introduction: Method and Materials

Method is defined as the body of systematic techniques used by a particular discipline, especially in a scientific setting (New Webster's Dictionary 1991: 628). The materials within this body of research (i.e. animal bones) determine the method of analysis. The questions asked and hypotheses presented in this paper (i.e. subsistence strategies and taphonomy) also determine the type of methodological applications required for this thesis. In this sense, zooarchaeological analysis is the method.

Subsistence strategies are economical and ecological activities through which a culture-group can sustain itself by continually procuring a range of nutritional sources, while ensuring that the energy costs of obtaining these nutrients will not exceed the benefits that they produce. Subsistence strategies are evaluated in relation to nutritional adequacy, which is acquired through great taxonomic variation (Reitz and Wing 1999; Schmitt and Lupo 1995).

The examination of the economic activities and dietary patterns of a culture group essentially creates the opportunity to better understand most aspects of a group's existence. Zooarchaeological analysis is the optimal method of study to use in order to determine the extent of the exploitation of animal resources at Ndondondwane. Zooarchaeology is the study of animal remains in context to human activities (Davis 1987: 19). It does not only reflect the behaviour pattern of animals, but also reveals specific information of the relationship between humans and animals. One can reconstruct the behaviour of ancient peoples and the environment in which they lived (Davis 1984, 1987). Zooarchaeologists study subsistence strategies with the basic concept of humans as predators, whether they are hunter-gatherers, horticulturists, agriculturists or pastoralists (Reitz and Wing 1999). The accumulation of skeletal remains that make up a faunal assemblage provides the evidence that allows the zooarchaeologist to determine such aspects as settlement patterns, technological abilities, and social organizations of past populations.

In order to fully comprehend the subsistence strategies of the Early Iron Age homestead of Ndondondwane, a reconstruction of the homestead's economy and diet first had to be completed. This will be accomplished through comprehensive detailed analysis and interpretation of all the zooarchaeological material excavated from the three archaeological campaigns conducted at Ndondondwane.

This chapter discusses the methods utilized in the analysis and interpretation of the zooarchaeological assemblage from Ndondondwane. Each research question was introduced with a subsequent section on what analytical technique will be applied to answer that specific query. It also presents many of the foremost zooarchaeological quantification applications that are used during the interpretation stage of the analysis. Finally, this chapter introduces the post-depositional processes that may affect and alter the individual bones as well as the entire assemblage.

II. Zooarchaeological techniques

Zooarchaeological analysis, in the context of this thesis, consists of a three-step method. Step 1 is to find the material. Step 2 is to conduct the identification and laboratory analysis. Step 3 is to undertake the interpretation of the analyzed data. Each are described more fully next.

A. Analysts and the location of research materials

The preliminary identification of all the zooarchaeological assemblages from Ndondondwane was conducted in the Republic of South Africa. Voigt and von den Driesch (1984) examined most of the bones from Maggs' 1978 excavation, with Voigt completing more of that assemblage at a later date (not published). These data have been obtained and are included in the current analysis. A small amount of the 1978 material, almost all of the 1982-1983 material, and a large portion of the 1995-1997 assemblage were analyzed by Dr. Greenfield and I in 1997 and 1998 (with the help of Elizabeth Arnold, Michelle Perles, and Claire Pfeiffer, as lab assistants). Between 2003 and 2005, Dr. Greenfield and Tina Jongsma (with the help of Matthew Singer) analyzed the remainder of the 1995-1997 bones. Matt Singer also contributed to the analysis by calculating and providing the three-dimensional coordinates for all units with bone, allowing a spatial analysis of the remains to be conducted. The wild fauna were identified by Liz Voigt, Haskel Greenfield, Tina Jongsma and Ed Fread, with the assistance of Shaw Badenhorst and James Brink.

The 1978 and 1982-1983 assemblages were curated in the National Museums in Pietermaritzburg and Kimberly, where the analyses were conducted. The 1995-1997 assemblage was analyzed in field laboratories set up in Ondini and Ndondondwane in 1997 and Pietermaritzburg in 1998 and 2003-2005. The raw, primary digital data were then brought back to the University of Manitoba for refinement and further interpretation.

B. Bone identification

Bone identification is primarily based on a comparison with faunal remains from known species or adequate reference collections. The purpose of the preliminary identification process is to record the highest level of data possible from each bone and bone fragment. This entails identification of taxonomic variables such as phylum and species determination (taxon); element type; portion of element; size of element; symmetry; level of fusion of the element; age of the individual; sex; fragment size; level of weathering; presence and level of burning; evidence of gnaw marks; evidence of butchery; identification of bone modification; and if any pathology is present. These categories of identification followed Dr. Haskel Greenfield's modified faunal code.

All of the zooarchaeological materials from Ndondondwane were initially sorted into two main categories – identifiable and unidentifiable bones. The unidentifiable bone fragments were afforded the maximum level of identification possible, e.g. medium mammal for taxon, long bone shaft for part, or calcined for burned. All unidentifiable bone fragments were counted and their volume measured through water displacement in millilitres (ml).

All bone fragments were organized into two separate headings: number of fragments and NISP (number of individual specimens). The number of fragments category represents a total count of all bone fragments present in the assemblage no matter what elemental affiliation was present. The NISP category represents each specimen individually, but groups together element fragments that may mend to form a single element (Greenfield 1986). Therefore, the total count of fragments will always be larger than the NISP count and not a true reflection of taxonomic frequency.

The identifiable bones and bone fragments were sorted into element groups and laid out anatomically to assist in appropriate identification.

C. Types of laboratory analysis

1. Measurement

Any complete bones or complete measurable sections were measured with calipers in accordance with the criteria listed in von den Driesch's *A Guide to the Measurement of Animal Bones from Archaeological Sites* (1976). In addition, several measurements described by Greenfield (1986) were collected. This allows for possible identification of such attributes as sex, dwarfism, castration, or just to log the osteometrics of an EIA zooarchaeological assemblage for future comparisons with other assemblages or similar modern species.

2. Data entry

All data collected from the analysis were entered into various generations of Excel spreadsheets for quantitative and qualitative purposes. Ultimately, they were all integrated into the latest version of Excel. Most lines of data were for single pieces or articulated groups of bones. A majority of the elements identifiable to a taxon and element or fragments of elements with special features (e.g. tools) were afforded a single line per bone. The unidentifiable fragments were grouped into categories and subsequent spreadsheet lines with fragments of similar description. This allowed for a complete and comprehensive data-set of the entire zooarchaeological assemblage from Ndondondwane, with the ability to access individual element information with ease. This data-set will eventually be accessible for other experts to examine the finalized spreadsheet for their own purposes.

3. Analytical categories

This sub-section describes some of the major analytical categories examined to satisfy the research questions and hypotheses that are the basis for this thesis.

a. Species identification

The identification of elements to species (at best) or phylum is the single most important level of zooarchaeological identification. This is the base level of analysis in order to reconstruct the subsistence strategy for Ndondondwane, as it allows for the determination of whether the occupants of a site practiced herding strategies or were strictly hunters.

An example of the reference material used during the identification process included: Schmid's (1972) atlas for standard identification, Boessneck et al. (1964) and Payne (1985) for sheep and goat distinction, Zaloumis and Cross (1992) for antelope horn differentiation as well as Walker (1985) for wild identification

b. Age determination

The most accurate methods to determine the age of each specimen in an assemblage include:

i) Tooth eruption and wear patterns – in most mammalian species, teeth erupt in a very predictable succession during their lifespan. These series of eruptions allow for an accurate aging technique. Furthermore, after eruption the tooth begins to wear down from normal grazing habits. The series of wear stages are assumed to occur at set intervals throughout the animal's aging process and can be assigned an age value as such (Rackman 1983: 268).

ii) Epiphysial fusion and suture closure – all elements within a maturing animal fuse at specific stages of its life, some continue to fuse late into adulthood. These rates of fusion have been long documented and are utilized as general indicators of age.

iii) Incremental layers of tooth cementum – the incremental layers of cementum on teeth are added at unvarying intervals seasonally. This is the most accurate method to determine an absolute age of an animal when the technology and equipment is available (Rackman 1983: 268).

iv) Other methods – alternative indicators of age from zooarchaeological material include: incremental lines in the cross-section of long bones and mandibles; development and size of antlers and overall size and robusticity of bones (versus porosity of bones from young individuals). (Reitz and Wing 1999)

Age classes categorized by the Greenfield Faunal Code (from youngest to oldest): with young (generally unfused or unerupted, but not identifiable to a more specific age class); foetal; infant; juvenile; subadult; subadult/adult; and adult. Each age class contains a sub-class of young, medium and old. Such precise aging classifications provide the analyst with a most accurate age at death pattern which will aid in determining the extent of primary and secondary product exploitation at the site (Greenfield 1988; Sherratt 1981).

c. Sex Determination

Identification of the sex of an animal, especially on a large scale within a zooarchaeological assemblage is a great indicator of herd management, particularly on determining primary or secondary product exploitation. Only a few elements and/or morphological indicators are available during this process. They include: the cranium;

pelvis; presence or absence of horns (only in some species); horn shape and consistency; size of canines; and the general size and density of elements (sexual dimorphism) (Reitz and Wing 1999).

d. Weathering and other taphonomic influences

Identification of stages of weathering, the presence of gnawing, and the damage of root etching to bone affords the bias into the analysis that influences of post-depositional taphonomic processes create. The levels of degradation of bone due to exposure to taphonomic processes are allocated a numerical value in order to provide a measurable aspect to the analysis, where 0 is equivalent to pristine and 3 represents heavy impact from taphonomic processes. (Lyman 1994).

e. Burning and butchering

Pre-depositional taphonomic processes, such as burning and butchering patterns, provide comprehension towards meat processing and cooking practices by the occupants of Ndondondwane. Identification of elements that may have been burnt and levels of burning will indicate choice of cuts of meat that were roasted and discarded.

Recognition of location and type of butchery marks in conjunction with animal physiology provides accurate information on the butchering patterns of a society, with the possibility of determining specific purposes of a butchering application, for example, marrow extraction (Kerr 2005; Lyman 1994).

D. Interpretation of the analyzed data

It is the interpretation of the analyzed zooarchaeological material from Ndondondwane that will determine the validity of this study. Quantification applications in Zooarchaeology must allow the analyst the ability to produce an appropriate representation of economically important taxa from the assemblage. Creation of quantification applications such as MNI and NISP lists allow for better comprehension of frequencies of each species present at Ndondondwane (Lyman 1994: 6-7). Unfortunately, none of the quantification techniques are perfectly accurate. Subtle differences in the assemblage may be missed, for example, the presence of cattle bones at a site may not represent that the society raised cattle, but may represent a trade network where cattle were given in exchange for a product or different species. As a researcher, it is imperative to be able to duplicate the results, proving that it is a testable quantification technique.

1. Quantification applications

The following section will provide a brief description on the major quantification applications used in Zooarchaeology that are relevant for the time period under consideration. Several measures are commonly used in the analysis of hunting-gathering assemblages, but the techniques described below are the most common used with large samples of domestic animal remains.

a. Number of identified specimens (NISP)

The NISP quantification method is the most straightforward of the applications. It is an actual count of each and every identifiable bone and bone fragment of each taxon that is present in the assemblage. NISP is utilized to provide an estimate of the relative frequency of taxa, in order to expand on the age and sex ratios within a site (Lyman 1994: 100, 102; Reitz and Wing 1999: 191).

The problems with NISP are that it assumes that all species have an equal opportunity to be recovered at the same rate, with the same amount of fragmentation and the same rate of survivorship. Each element or identifiable fragment is counted as an individual specimen, disregarding if some elements are articulated or from the same animal (Reitz and Wing 1999: 191-192). Therefore, the bias of overrepresentation may arise within the assemblage.

b. Minimum Number of Individuals (MNI)

MNI represents the overall frequency of the most abundant identifiable bones for each species. This application provides a count of the smallest number of individuals present within a taxon. It takes the most abundant element and divides them into left and right sides to determine the most numerous element type from one specific side (Lyman 1994: 100; Reitz and Wing 1999: 194-196). MNI is considered the most common of estimates for secondary data. It is capable to evaluate the presence between all taxa and species, such as mammals, birds, fish, amphibians and reptiles (Hesse and Wapnish 1985: 113-115; Rackman 1983: 256-257; Reitz and Wing 1999: 199-200).

The weakness to the MNI application is that it may under represent a common species, or over represent the rarer species. Depending on the complexity of the sample, it can be a very difficult application to use to duplicate another researcher's results (Reitz and Wing 1999: 195). Furthermore, this application does not allow for meat weight differences within each species, such as one cow will have a smaller representation of elements when compared to one hundred and fifty rabbits, yet the cow will possess more meat weight (Davis 1987: 36).

c. Relative Frequency (RF)

Relative frequency is one of the more complicated forms of quantification due to the requirement of a series of mathematic applications. This process is intended to compensate for weaknesses inherent to the previous two quantification methods (NISP and MNI). RF searches for the relative abundance of an individual species and not the true number of animals or projection of their number. RF is calculated through the listing of the types of bones for a specific category and the actual number of fragments of bones present. Therefore, counting the number of fragments and dividing by the number of types (Hesse and Wapnish 1985: 115-117; Rackman 1983: 261). In other terms, the number that each skeletal element is recovered divided by the frequency of occurrence on each animal, i.e. two humeri occur in all mammals. This total is then divided by the number of that specific skeletal element from a species recovered from a zooarchaeological assemblage (Reitz and Wing 1999: 200-201).

A weakness in this technique is that it is most reliable only when used with larger samples. However, it has never been used in the region and would difficult to compare with other assemblages. Hence, it was not used in this thesis.

Interpretation in this zooarchaeological context is the testing for patterns within the analyzed faunal assemblage, for example, uniform culling of domestic stock, butchery processes, taxonomic diversity (quantities of individual species, ratios of species, ratios of domestic stock versus hunted). Essentially, in context to zooarchaeological analysis, ancient human behaviour may be discerned through (1) the selection process of animals from the population, (2) the treatment of killed animals and their parts, and (3) the deposition of the remains that subsequently create a zooarchaeological assemblage (Turner 1984).

d. Taxonomic diversity

Within zooarchaeological analysis, positive species and element identification are essential in order to provide detailed information on understanding and measuring the taxonomic diversity at Ndondondwane. Taxonomic diversity consists of two attributes, (1) taxonomic richness – the number of individual species present in the zooarchaeological assemblage (variety of species present), and (2) taxonomic evenness – equal proportion or uniformity of distribution of each species represented in the assemblage (Schmitt & Lupo 1995; Kintigh 1989; Cruz-Uribe 1988). The relative abundance of identified elements and species in the assemblage can be directly associated with the relative abundance of meat that was available to the local population. In turn, the analyzed bones directly reflect the choices made by the occupants of Ndondondwane in context to domesticate slaughtering frequencies and the selection process of hunting wild game (Gilbert and Singer 1982). With taxonomic diversity established, the basic pattern of subsistence for Ndondondwane will become more apparent and a reconstruction of the economy will follow.

III. Influences that may affect zooarchaeological analyses

There are numerous external influences that can affect the directionality of analytical applications during zooarchaeological analysis. They can include the size of the sample that may contribute to a biased zooarchaeological assemblage. The effect of taphonomic processes on bones and entire assemblages that (if not considered in the analytical process) may result in an inaccurate picture of human activities and subsistence choices.

A. Problems of sample size in conjunction with sampling biases

The overall validity of the results of analysis from any zooarchaeological assemblage is heavily contingent on the size of the sample. Due to influences such as human behaviour during the kill, meat extraction and deposition of skeletal materials, in conjunction with post-depositional taphonomic processes, no zooarchaeological assemblage is ever complete. Although, all zooarchaeological assemblages are incomplete, it is considered that the more extensive the sample size collected from the site, the more dependable the analysis will become. For example, Hall (1984b: 373) explains that smaller faunal assemblages from archaeological sites tend to exaggerate the MNI of rarer species thus skewing the species frequency data. This is further corroborated by Plug (1984: 357), who claims that both MNI and NISP can be drastically affected by small sample biases (further information on these quantification applications will be provided later in this chapter).

Sample bias may also extend into excavation techniques at the site. If the archaeologists only excavate specific areas or features of a site, the zooarchaeological assemblage may contain a heavy bias due to the possibility of a lack of unilateral depositional methods by the inhabitants long ago. Fortunately for this thesis, through all three archaeological campaigns (especially Greenfield and van Schalkwyk's work), every discovered feature and activity area was almost entirely excavated (with the exception of the animal section of the Dung Area). Therefore, the zooarchaeological assemblage sample taken from Ndondondwane is as complete and unbiased as could be expected.

Archaeological sites throughout southern Africa are reputed to be extremely harsh on zooarchaeological materials. Due to the exposed nature of EIA sites, bone preservation is generally quite meagre, and an assemblage of two thousand identifiable bones and bone fragments is considered impressive (Beukes 2000: 46). At 18,486 identifiable bones and bone fragments, the zooarchaeological assemblage collected during all three archaeological campaigns at Ndondondwane is one of the largest for EIA sites in southern Africa, especially in the KZN region.

An example of sample bias at Ndondondwane corresponds with the need by this research to expand the zooarchaeological analysis to all areas of the site. The 1978 excavation and subsequent zooarchaeological analysis at Ndondondwane have concurred with Maggs' (1989) observation of a reliance of domesticated animals for most of the subsistence of EIA communities in KZN (Voigt and von den Driesch 1984). The zooarchaeological analysis conducted by Voigt and von den Driesch (1984: 103) concluded that the faunal assemblage from Ndondondwane held evidence that "few other [than hippopotamus] wild animals appear to have been hunted" "...and may prove to have the least variety of any Iron Age site" (1984: 99), thus establishing the concept of a specialized diet of primarily domesticated stock (Plug and Voigt 1985).

The Voigt and von den Driesch (1984) report was only a preliminary report of the zooarchaeological assemblage excavated by Maggs (1984) from Ndondondwane. The total size of this assemblage consisted of exactly 5,624 identifiable bone elements and fragments of elements (Voigt and von den Driesch 1984: 97). This consisted of less than one eighth of the size of the rest of the entire zooarchaeological assemblage accumulated and analyzed by myself, Dr. Greenfield and others during both Greenfield and van Schalkwyk's archaeological campaign (1995-1997), and Loubser's 1982 excavation (Loubser 1993).

It is possible that Voigt and von den Driesch (1984) were unable to gain a full perspective of the breadth of animal resources utilized by this EIA community due to a large, yet limited amount of zooarchaeological material available to them for study.

According to Maggs (1984: 71), only a small portion of the site (the mound area) was excavated by an average of 17 people over a three-week period (see chapter 4). Although an impressive amount of material was excavated from the mound area within such a condensed time period, it consisted of only a single feature within a highly complex EIA homestead (at the time of excavation, the complexity of Ndondondwane was not yet). Therefore, all the zooarchaeological material from the Mound Area analyzed and interpreted by Voigt and von den Driesch (1984) has to be considered as possessing a certain degree of bias. To fully understand the subsistence strategies of the homestead of Ndondondwane, one must examine the zooarchaeological remains from a number of depositional areas excavated, encompassing the entire site.

Another strong aspect to consider is the oral traditions from populations local to KZN Province. Historic researchers provide information that hunting was a vital portion of daily life. The hunting of wild game was not solely an important source of sustenance, but was also steeped in both recreational and ritual activities. For example, the hides and teeth of carnivores and primates were primarily collected for adornment and ceremonial purposes, not normally for meat. As well, certain skeletal elements of carnivores and primates were utilized by witch doctors in their divining kits or for medicinal purposes (Plug and Voigt 1985). Today, local populations are no longer permitted to hunt due to a devastating drop in numbers and displacement of game populations, which in turn created strict protection laws governed by the Republic of South Africa.

Therefore, reconstructing the subsistence strategy of a Homestead site from a single deposit will create a sample bias as described above. The complete zooarchaeological analysis of all features and activity areas of Ndondondwane will provide the best opportunity to comprehend the subsistence strategy of the site. It may differ little from Voigt and von den Driesch's (1984) summation, but the knowledge that "no stone was left unturned" will contribute greatly to EIA archaeology in southern Africa.

Another issue was the analysis and data entry from the 1978 zooarchaeological assemblage. During the 1980's, zooarchaeological analysis was still in its infancy with full knowledge of the potential range of techniques and categories not yet realized. Therefore, Voigt's analysis was very basic when compared to present day expectations with a basis on species, element, part of element, and if possible symmetry and age. Incorporation into the data-set proved difficult with the multiple missing categories of the Greenfield zooarchaeological analysis system. A process of compensating for missing data in blank Excel cells included adding zero values or "not analyzed" in order to fill a blank cell to assist during generation of pivot tables.

Another problem is the evolving nature of coding systems. Voigt's letter coding system for the identification of the 1978 assemblage was difficult to interpret and translate for entry into the larger data-set and was extremely time consuming. It was also more abbreviated than the system developed by Greenfield for coding the bulk of the assemblage. Numerous attempts to contact Voigt for clarification on specific coding problems proved unsuccessful.

b. Bone preservation and taphonomic processes

Prior to establishing the human behaviours that created the zooarchaeological assemblage from an archaeological site, the analyst must determine the extrinsic processes that may have dramatically altered or modified the remains after deposition

(Avery 1984: 330; Reitz and Wing 1999: 110-115). The environment that contains the deposited assemblage is considered an active state "full of physical, chemical, and biological processes capable of transforming the information originally encoded into the physical remains" (Hesse and Wapnish 1985: 20). The study of these processes is known as taphonomy.

In context to zooarchaeological remains, taphonomic processes are defined as any factors that cause a "fossil assemblage to differ from the deposited, death and life assemblages that underlie it" (Klein 1984a: 8). Any and all zooarchaeological assemblages are influenced to some degree by post-depositional taphonomic processes that may further the fragmentation of elements to completely eradicating them from the archaeological record. This in turn will create a bias on bone survivorship and therefore skew the analyzed zooarchaeological data (Davis 1987: 27; Lyman 1994: 1; Reitz and Wing 1999: 110-115).

The level of bone preservation and bone survivorship is dependent on numerous factors, such as cultural butchering patterns, carnivore gnawing, weathering, soil acidity, element density, even the size of the element and element type (Davis 1987: 27-28; Lyman 1994: 3; Reitz and Wing 1999: 110-115; Voigt 1983: 90-91). Each is discussed next.

The structural density of certain elements within an assemblage allows for greater survivorship against taphonomic processes. The structural density of elements increase as the animal matures and the bones fuse. Bones with lower levels of structural density are more likely to be destroyed because they possess a greater level of porosity; are more liable to be displaced by fluvial processes; are more prone to be damaged by trampling and/or carnivore activity (Lyman 1994: 234-258); and in context to Ndondondwane, are likely to be shattered by historic and modern agricultural ploughing.

Although all elements will fuse and increase in density as the animal ages, they do so at different times of the individual's life. For example, the distal epiphysis of the humerus fuses to the shaft at a much earlier age than most other elements. Therefore, the distal humerus will be structurally denser than other elements at a younger age. If the slaughter patterns exploit younger individuals, then distal humeri may possess a higher rate of survivorship than other elements in the assemblage (Voigt 1983: 93-96). Analysis of a zooarchaeological assemblage from a Bronze Age site of Grimes Graves in southern England determined that 30-40% of fused bones survived of their predicted number, while only 5-15% of unfused bones were present. The expected numbers of bones present at the site were extrapolated from the presence of large numbers of both unfused and fused mandibles (Legge 2005: 9).

It is the responsibility of the zooarchaeologist to recognize and differentiate between the various forms of taphonomic processes on bones and even able to distinguish those bones that may exhibit multiple processes on a single element (Voigt 1984b: 352).

IV. Specific analytical techniques to answer research questions

The following section re-introduces the research questions from chapter 1 and addresses the appropriate method of analysis required to satisfy each research question.

A. Research question 1.

Was the community of Ndondondwane more reliant on domesticated animals or were wild animals the primary protein source?

To answer this query it is necessary to quantify the zooarchaeological data using NISP. This is essentially the finest method to estimate the relative abundance of each species of animal present in an assemblage. For a more realistic comprehension of domestic versus wild species exploitation, it must be realized that it is the accumulation of all identifiable domestic species bones compared to the total number of elements within the entire wild species assemblage that determines the subsistence focus by the EIA inhabitants of Ndondondwane. For example, cattle elements may outnumber the total number of elements representing the Common Duiker, but when all the wild bovid species elements are added up, the balance may have shifted.

B. Research question 2.

a) If domestic animals were the primary source of meat, was subsistence specialized or generalized?

In order to determine a specialized or generalized subsistence economy, taxonomic diversity would have to be established. A specialized subsistence economy focused on mixed farming, would exhibit a very large percentage of cattle, goat and sheep bones in the zooarchaeological assemblage with a high concentration of a single specific domesticate taxa (i.e. cattle). On the contrary, evidence for a generalized subsistence economy at Ndondondwane would be indicated by a taxonomic diversity of domesticates intermixed with a variety of wild specimens in the assemblage (Cruz-Uribe 1988: 179; Schmitt and Lupo 1995: 496).

b) Domestic animals were exploited for which products (meat, bone, milk)?

In order to determine the nature of exploitation of domestic species, it is simplest to construct age-at-death profiles or harvest profiles. Harvest profiles measures the frequency distribution of age at time of death for each individual species. These profiles can be supplemented with sexing information. For example, for a meat based economy, the culling patterns of domesticates would be dominated by young individuals, with a larger number of males culled (as they attain optimal weight) over females due to reproductive purposes. A few males would remain for breeding. In a milk production based society, the excess breeding stocks of both sexes are culled at the moment the milking is unaffected (Davis 1993; Greenfield 1988; Payne 1973). Conversely, if a greater proportion of older individuals are represented in the zooarchaeological assemblage, then a mixed economy of both primary and secondary products was practiced.

Specific frequencies of species in conjunction with sex and age at death assist in ascertaining herd management practices such as selective culling patterns that may be seasonal, or age determined (Reitz and Wing 1999: 179). Epiphysial fusion rates and tooth eruption and wear sequences are used to accurately identify age at time of death.

c) Did the occupants of Ndondondwane rely most on primary or secondary products from their domestic herd?

This research question requires a more focused version of analysis of research question 2b. In order to determine what the main form of economy was at Ndondondwane, overall ageing and sexing groups must be determined. The majority of the culled domestic herds will either fit in the age and sex grouping that is associated with a culling pattern for primary or secondary products.

C. Research question 3.

a) Did the occupants of Ndondondwane pursue a mixed hunting and fishing strategy among the wild animals that was a reflection on the diverse availability of the fauna in the wild?

Once a vast diversity of possible food sources that is available in the surrounding region of the site is determined, a detailed taxonomic inventory (especially species identification) with frequency of occurrence is created. From this taxonomic list it can be determined the presence of wild fauna choices for sustenance and conversely, what wild fauna were disregarded as a food source.

b) In terms of the wild taxa, was the occupant's economy driven by a culturally selective strategy?

As a continuance from research question 3a, a pattern of selective strategy can be determined exhibiting overall choice by hunters that either included or overlooked specific wild species that provided equal amounts of sustenance. A discrepancy between the frequencies of occurrence of wild taxa identified at Ndondondwane with a base knowledge of wild fauna in the immediate area will determine if conscious choices may have been made on food selection.

D. Research question 4.

Is there a discernable differentiation of dietary patterns between the three chronological horizons identified by Greenfield and Miller (2004) at Ndondondwane?

To determine if a separation of subsistence strategies exist between horizons at Ndondondwane, the taxonomic inventory and frequencies of occurrence of each species and their exploitation must be considered for each temporal period (by horizon) and compared to each other.

V. How does this analysis differ from that previously conducted on the zooarchaeological assemblage at Ndondondwane (Voigt and von den Driesch 1984)

In the 30 years since Voigt and von den Driesch did their initial study of the Ndondondwane fauna, there have been many new developments in how the site was excavated and in the advancements of zooarchaeological analysis.

A. Excavation locations

Sampling from multiple zones of a site provides a greater opportunity to extrapolate more data on the culture or site being studied, over a single feature excavation. After Maggs's excavation campaign of the Mound Area, Loubser continued the Mound Area dig but expanded his archaeological investigations to the Dung Area and Midden 1. By 1995, Greenfield et al. tested for and excavated all found features at Ndondondwane, completely encompassing the site and compiling a zooarchaeological assemblage that is one of the largest in sub-Saharan Africa. This created the most optimal sampling strategy to fully study and interpret the EIA activities and in particular the diet of the residents at Ndondondwane.

B. Techniques of zooarchaeological analysis

At the time Voigt and von den Driesch analyzed the majority of Maggs' zooarchaeological assemblage from Ndondondwane, zooarchaeological analysis was still in its infancy as a valuable investigative resource. In fact, Maggs' excavated assemblage was used to test criteria on differentiation between goat and sheep elements for accurate species identification (Voigt and von den Driesch 1984: 96). Similar techniques of sheep and goat species identification and differentiation are widely utilized today.

The analytical categories utilized by Voigt and von den Driesch in their 1984 publication are basic by present day standards. The categories presented by Voigt and von den Driesch include: provenience of each element; species; element type; portion of element; side of body the element belongs to; age of individual (not always used); and whether any discernable marks (i.e. butcher marks, burning, etc.) were noted. Although these analytical categories do allow for an accurate species list from the fauna at Ndondondwane, further interpretation of the assemblage is extremely limited.

The techniques for zooarchaeological analysis devised by Greenfield (2005b) permitted a more detailed extraction of information from the assemblage at Ndondondwane. For example, the categories for aging of elements required an exact notation on levels of fusion for each bone in collaboration with the age group categories (previously described in this chapter), as well as sexing. These allow for harvesting profiles which in turn allow the researcher to determine if primary and/or secondary products extraction were present at the site. Greenfield (2005b) also noted such categories as taphonomic processes, presence and levels of burning, precise observations of butchery marks and if possible type of implement used; size of each fragment. Unfortunately, the bones analyzed by Voigt and von den Driesch from the 1978 excavations did not include these variables. These are noted as not recorded in the database.

VI. Summary and conclusion

The methods and techniques for zooarchaeological analysis described in this chapter demonstrates the need to compensate for the various taphonomic processes and influences that can and will affect an assemblage to the point where true identification may be lost. This chapter also identified the benefit of a complete sample of zooarchaeological material from a site in order to lessen any bias of the results.

All zooarchaeological analysis was accomplished by trained zooarchaeologists, utilizing both detailed published references and available comparative collections from local museums, loaned from private collectors or recently discarded elements found in the field. All data was entered into Microsoft Excel spreadsheets under specific headings in laptop computers.

Due to taphonomic processes such as pre-depositional and/or post-depositional damage and influences of erosion or weathering of many bones or bone fragments in the assemblage, a complete identification of each individual element was not possible. In specific cases, only certain categories could be positively identified and entered in as such. Every bone and bone fragment has been identified to the highest specific level possible.

Specific analytical techniques address the appropriate form of method of analysis required to satisfy each research question introduced in the first chapter. The standard zooarchaeological analytical techniques are also outlined.

Since Voigt and von den Driesch's (1984) analysis of the Mound Area fauna excavated by Maggs in 1978, zooarchaeological analytical techniques have expanded exponentially into a more precise research tool. This has allowed zooarchaeologists to scrutinize an assemblage in order to extrapolate a greater detail of information that allows for a higher level of interpretation on the activities that occurred at a site. This study, together with Greenfield and van Schalkwyk's archaeological campaigns utilized these techniques.

Chapter 6: Zooarchaeological Data Description

I. Introduction

This chapter provides the results of the zooarchaeological analysis of the Ndondondwane assemblage. With subsistence strategies being the subject of research for this paper, the primary data is therefore the zooarchaeological assemblage collected and analyzed from Ndondondwane. The assemblage consists of greater than 47,000 bones, shells and fragments, all entered into Excel spreadsheets in preparation for the interpretative stage of analysis (Chapter 7).

Ndondondwane was inhabited for a brief period during the EIA (a maximum of 50 years). The materials recovered during the three archaeological campaigns all belong to a single temporal and cultural phase – The Ndondondwane Phase (AD 790 to AD 970 calibrated). Therefore, the analysis (Chapter 6) and interpretation (Chapter 7) of the zooarchaeological data from Ndondondwane represent a rare glimpse in the subsistence strategy of a small group of ancient people over a period of time that spans no more than two to three generations.

II. Quantity of zooarchaeological remains from Ndondondwane

The total combined quantity of bone and shell fragments recovered and identified at Ndondondwane from all three archaeological campaigns as well as all features and levels within the site, amounted to a NISP of 47,048 (Table 1). During analysis, all zooarchaeological material was quantified by total number of fragments and by NISP (number of individual specimens). The total number of fragments represented a count of every piece of bone or shell within the assemblage without consideration whether it mended with other fragments to amount to a single element (NISP). The number of fragments amounted to 50,643, 3,595 fragments more than the NISP count (Table 2).

As described in Chapter 5 (Methods), the bulk of the zooarchaeological assemblage was quantified through the measurement of water displacement in millilitres. We were unable to quantify a majority of the 1978 material in this manner due to lack of access, but the remaining zooarchaeological material from the second and third campaigns were measured and are as follows. The gross number of bones and fragments measured for displacement was 39,357, with a mass displacement of 169,611 ml (Table 3). The majority of the material was recovered from the central area consisting of the Dung Area (45.2%), the Mound Area (40.3%), Transects 1 and 2 (2.1%); with the other outer Areas (periphery) combining for the remaining 12.4% of the assemblage (Table 3).

III. Levels of identification

From the grand NISP total of 47,048; 18,487 bones, shells and fragments (39.3% of the assemblage) were identifiable to the finest level of identification (species and element). All fragments could be identified at least to the level of class (e.g. Mammal, Aves, etc.). While 28,561 (60.7%) bone fragments could only be identified to this grosser taxonomic level and were therefore not useful for specific taxonomic analysis (Table 4). The unidentifiable data was utilized for gross counts and taphonomic analysis (see below in this chapter).

The range of identifiable bone fragments differed greatly at each area of the site. Unidentifiable fragments consisted of bone fragments that could not be positively identified to species group or element type, for example, long bone and/or flat bone fragments, as well as detritus that can be only assigned to a Class-level of taxonomic classification (i.e. Mammal or Aves). The amount of identifiable zooarchaeological material at Ndondondwane ranged from the central areas at 37.8% in the Dung Area and 47.8% at the Mound Area and 33.6% identifiable at Transect 1, 13.8% identifiable in Transect 2 and the peripheral areas with 38.2% and 38.4% in Midden 1 and Midden 2 respectively, and 15% in Midden 3 (Tables 5 to 12). The bulk of the unidentifiable material was highly fractured and/or weathered bone fragments that are typically found at EIA sites due to the exposed nature of the settlements.

IV. Spatial distribution of zooarchaeological remains

The bulk of the zooarchaeological remains were located within the two zones of the Central Area, the Dung Area with a NISP of 21,506 (45.8% of the assemblage) and the Mound Area with a NISP of 16,864 (35.9% of the assemblage). Transects 1 and 2 combined with a small sample of material from surface collections amounted to a NISP of 1,030 which represents 2.25% of the assemblage. The peripheral middens accounted for only 18.2% of the assemblage (Midden 1 = NISP 1,747, 3.7%, Midden 2 = NISP 1780, 3.8%, and Midden 3 = NISP 4066, 8.6%). The Charcoal Preparation Area did not contain any zooarchaeological material (Table 1).

V. Temporal sequence

As described in Chapter 4, a series of deposition levels called Cultural Horizons were identified throughout Ndondondwane. This pan site stratigraphy was representative of alterations in settlement usage over the periods of incipient use, full occupation, abandonment and reuse. The horizon temporal sequence is as follows: 1: Lower (oldest, initial occupation); 2: Middle (peak of settlement expansion and occupation); 3 & 3a: Upper (abandonment of site); 3b: Upper (reuse of site for iron smelting); 4: Plough zone (recent farming activities – displaced material from lower horizons); and 5: surface (surface collection of zooarchaeological remains – displaced from lower horizons from farming activities) (Greenfield and Miller 2004: 1514-1515).

The distribution of NISP by horizon differs from the gross NISP totals provided in previous due to the exclusion of some data that lacked a provenance pertaining to a single horizon. Therefore, the total NISP for the secured horizons is 40,658 (Table 13). These secure data are distributed in the following temporal sequence:

1. Lower Horizon – NISP 9,759 (24% of secured assemblage);

2. Middle Horizon – NISP 20,452 (50.3%);

3. Upper Horizon – NISP 18 (0.04%);

3a. Upper Horizon – NISP 1,501 (3.7%);

3b. Upper Horizon – NISP 367 (0.9%);

4. Plough Zone (displaced soils) – 8,537 (21%); and

5. Surface – NISP 24 (0.06%) (Table 13).

The Middle horizon was the cultural horizon with significantly the highest amount of zooarchaeological material from the Ndondondwane assemblage (50.3%). The oldest level of occupation, the Lower Horizon housed 24% of the assemblage present. The three separated Upper Horizons indicated an extremely sharp drop in the amount of zooarchaeological recovered. The Upper Horizon (3a.) at 3.7% of the total secured assemblage contained the largest amount of bone fragments in the Upper Horizon. The Plough Zone is believed to be mixed soils displaced by decades of modern agricultural ploughing contained the equivalent of 21% of the entire zooarchaeological assemblage from Ndondondwane. This is likely a mixture of material from all Horizons, dependent on the depth and location of the Horizons for each area, as well as accessibility by the plough.

VI. Cultural horizon by area

When the zooarchaeological assemblage was separated by cultural horizon distribution and examined by Area, it becomes apparent that only the centralized zones of the Dung Area and Mound Area as well as Transect 2 contained all of the major horizons (Lower to Plough Zone). Conversely, Midden 1 and Midden 3 both contained just the Middle and Upper 3a horizons while Midden 2 only contained the Middle horizon (Tables 14 to 20). Tables 14 to 20 demonstrate the NISP distribution of these areas for each Horizon. There are significant differences between cultural horizons within these areas. For example, the NISP results pertain to the Lower and especially the Middle horizons with drastic declines in bone numbers in the Upper horizons.

VII. Species representation at Ndondondwane

In total, 88 different taxa (most of who were identified to the species level) were positively identified from the Ndondondwane zooarchaeological assemblage (Table 21). The number does not include classifications that were identified to a lesser degree, for example size class groups such as Bovid Class 3, Mammal-Large, Rodent-Small, etc (for a complete species list see Table 22).

Mammalian species were the most dominant Class represented at Ndondondwane with a NISP of 46,296 (98.4% of the entire zooarchaeological assemblage) (Table 23), while the remaining Classes (Aves, Pisces, Molluscs, Reptiles and Amphibians) were nearly non-existent in comparison, with a combined NISP of 749 (1.6% of the assemblage) (Tables 23 to 28). The Mammalian Class contained both domestic and wild species as well as a few scattered human elements recovered during excavation.

A. Domestic versus wild taxa

Domesticated species (NISP 9,191) outnumbered the wild species (NISP 3,959) by greater than a 2.3:1 ratio (Table 29). The wild NISP included hippopotamus (NISP 1,010) and elephant (NISP 559) ivory fragments. The ivory fragments do not have any direct correlation to the diet and subsistence strategies of the inhabitants of Ndondondwane, since the ivory was likely collected with the intention for creation of tools and adornment and not for food. Therefore, when the ivory fragments are removed from these calculations a NISP of 2,390 fragments results. The wild to domestic ratio is then refined to 3.8:1. Molluscs and intrusive species such as small, medium and unidentifiable rodents as well as most reptiles and amphibians were not included in the wild classification tables due to the non-relevant nature of the species to this data.

B. Domestic taxa

1. Domestics

There were five domestic species present at Ndondondwane, cattle (*Bos taurus*); sheep (*Ovis aries*); goats (*Capra hircus*); including the indeterminate caprine grouping of sheep/goat (*Ovis/Capra*); as well as dog (*Canis familiaris*) and chicken (*Gallus domesticus*). As a complete identified species, cattle were the most common domesticate with a NISP of 2,593, while sheep (*Ovis aries* - NISP 1,529), goats (*Capra hircus* - NISP 535) and the indeterminate sheep/goat (*Ovis/Capra*) classification (NISP 4,386) were the most abundant domestics with a combined NISP of 6,450 (Table 29). Therefore an overall small stock to cattle NISP ratio of 2.5:1 existed at Ndondondwane.

The strong presence of the domesticated dog was reflected with a NISP of 108, with another 23 classified as probable dog (Table 29).

Furthermore, the introduction of domesticated chicken (*Gallus domesticus*) to EIA sites in southeastern Africa is represented with a NISP of 15. There is an additional two fragments that are suspected to be chicken (Table 29).

2. Domestic distribution by secured horizon

Analysis of the distribution of domesticated species by secured horizons (Table 30a and 30b) revealed that the largest accumulation of zooarchaeological material was located in the Middle Horizon (NISP 3,915) with 52% of the assemblage. The oldest horizon (Lower Horizon) contained the second largest NISP of 1,974 (26.3% of the assemblage). The Upper Levels, Horizons 3a and 3b, exhibited a drastic drop in zooarchaeological material with a combined NISP of 435 (5.8%) or individual NISPs of 193 and 242 respectively. The Plough Zone had a NISP of 1188 (15.8%).

The sheep/goat to cattle NISP ratio for the secured horizons ranged from 2.1:1 (Plough) to 3.1:1 (Middle and Upper 3b Horizons) for across the entire site (Table 30a and 30b). The sheep to goat ratio for the secured horizons varied greatly from 2.7:1 in the Lower Horizon to 18:1 in the Upper 3a Horizon. These numbers may not be concrete due to the large number of zooarchaeological material that could be identified as either sheep or goat, but a distinction of either specific species could not be made.

3. Domestic distribution by area and secured horizon

The distribution of domestic species by a combination of Area and secured horizon (Table 31) revealed the following data.

a. Dung Area

The Middle Horizon contained the most domesticated zooarchaeological material with a NISP of 1,739 (23.2% of the total site assemblage), the Lower Horizon was second in quantity with a NISP of 1,125 (15%). The number of fragments in the Upper Horizon declined sharply with a NISP of just 106 (1.41%) followed by a small increase in the Plough Zone (NISP 326).

Cattle were present in every cultural Horizon in the Dung Area and were most prevalent in the Middle Horizon with a NISP of 585. The Lower Horizon contained the second highest NISP with 345 cattle bone fragments recovered (31).

Sheep and goats were the most abundant domesticated species found at the Dung Area. They were well represented in the Lower and Middle Horizons. Although the sheep and sheep/goat categories both increased from the Lower to the Middle Horizon, the NISP for goats decreased slightly during the same transition (Table 31). All caprine totals dropped considerably into the Upper Horizon.

The sheep/goat to cattle NISP ratio averaged 2:1, with the Upper Horizon peaking at a 4:1 ratio. The sheep to goat NISP ratio for the Dung Area averages out to 2.5 sheep for every goat, with the Middle and Upper Horizons at a 3:1 ratio.

Domesticated chicken was present in all Horizons except the Upper Horizon, although chicken was clearly most abundant in the Lower and Middle Horizon with only one fragment recovered from the Plough Zone (Table 31).

Domesticated dog was present in all Horizons at the Dung Area, but was most numerous in the Lower (NISP 7 + 1 possible) and Middle (NISP 21) Horizons. The

Upper and Plough Zone Horizons each contained a NISP of 3 dog fragments (Table 6.31).

b. Mound Area

The Mound Area contained the bulk of the overall domesticated assemblage from Ndondondwane with a NISP of 3,574 (47.6% of the entire assemblage). The majority of the Mound Area assemblage was recovered from the Middle Horizon with a NISP of 1,702 (22.7% of the entire assemblage). The Lower Horizon held only a NISP of 768, while the Plough Zone Horizon had a NISP of 862. The Upper 3b Horizon demonstrated a drastic decline in zooarchaeological remains with a NISP of only 242 (Table 32).

Similar to that of the Dung Area, cattle were well represented in every Horizon in the Mound Area. The Middle Horizon was the most abundant in cattle with a NISP of 411, while the Lower Horizon contained a NISP of 188. A dramatic decline of cattle was identified in the Upper Horizon (NISP 59) with a sharp increase in the Plough Zone (NISP 256) (Table 32).

Caprines followed a similar pattern to that of the Dung Area. Sheep, goat and the combined category all increased swiftly from the Lower to the Middle Horizon, and then dropped in the Upper Horizon. The presence of dwarf goat (NISP 3) was identified only in the Lower Horizon (Table 32).

The sheep/goat to cattle NISP ratio averaged slightly higher than the other areas with nearly a 2.8:1 average. The Lower, Middle and Upper 3b Horizons all possessed a 3:1 ratio while the Plough Zone Horizon was the lowest ratio at 2.2:1. The sheep to goat NISP ratio ranged from 5:1 in the Lower Horizon, 4:1 in the Plough Zone to 3:1 in the Middle Horizon and 2:1 in the Upper 3a Horizon.

Unlike the Dung Area, the domesticated chicken was found in the Plough Zone (NISP 4 + 1 probable) with only one other fragment in the Lower Horizon. Chicken was absent in the Middle and Upper Horizons (Table 32).

The domesticated dog was identified in all Horizons, but was most abundant in the Lower Horizon (NISP 32 + 6 probable), followed by the Plough Zone (NISP 17 + 3 probable). Dog was least represented in the Upper 3b Horizon with a NISP of only 2 probable (Table 32).

c. Transect 1

The Transect 1 Area was occupied during the Lower and Middle Horizons with NISPs of 64 and 16, respectively. Cattle and the sheep/goat category were present in both Horizons while goat was identified in only the Lower Horizon (Table 36).

The sheep/goat to cattle ratio in the Lower Horizon was 1.3:1 while the sheep to goat ratio was highly one sided with a 31:1 result. The Middle Horizon exhibited a 1:1 sheep to cattle ratio as no goats were identified in the assemblage. Furthermore, no domesticated chicken or dog remains were recovered from Transect 1 (Table 36).

d. Transect 2

Transect 2 contained very few domesticated zooarchaeological remains throughout with a combined NISP of 20 over the Lower Horizon (NISP 17), Middle Horizon (NISP 2) and Upper Horizon (NISP 1). Cattle were found in all three Horizons, while sheep/goat was identified only in the Lower Horizon (Table 37).

The sheep/goat to cattle ratio in the Lower Horizon was 2.4:1, while only cattle were identified in the Middle and Upper Horizons. No sheep or goats were positively identified through Transect 2. Similarly, neither chicken nor dog remains were recovered (Table 37).

e. Midden 1

Midden 1 consisted of only the Middle and Upper 3a Horizons, with NISPs of 167 and 80, respectively.

Cattle were represented in both Horizons with twice the amount in the Middle Horizon (NISP 52) than the Upper Horizon (NISP 25) (Table 33).

Sheep and sheep/goat categories were identified in both Horizons, with a larger NISP in the Middle Horizon than the Upper. Goat was only found to be present in the Middle Horizon (Table 33).

A sheep/goat to cattle ratio of 2:1 was found for both Horizons. The sheep to goat ratio was more diverse with a 6.5:1 ratio in the Middle Horizon while the Upper 3a Horizon did not contain any identified goat fragments while there existed a NISP of 26 for sheep.

Chicken was not identified in Midden 1 and dog was present in only the Middle Horizon (NISP 6).

f. Midden 2

Midden 2 was only utilized during the Middle Horizon and held a NISP of 226. Cattle were well represenfed with a NISP of 87 as well as sheep (NISP 25), and sheep/goat (NISP 113). Only one goat fragment was identified. The sheep/goat to cattle ratio was 1.6:1 and the sheep to goat ratio was 25:1. No chicken or dog remains were recovered from Midden 2 (Table 34).

g. Midden 3

Midden 3 was similar to Midden 1 within timeframe of occupation spanning the Middle to Upper 3a Horizons (Table 35). The Midden held an overall NISP of 71, with the Middle Horizon containing the bulk of the assemblage (NISP 64).

Cattle were present in both Horizons with NISPs of 29 and 4, respectively. Sheep were also found occupying both Horizons in Midden 3 (NISP 2 and 1, respectively). The sheep/goat to cattle ratio was essentially equal at 1:1 for both Horizons, while no goats were positively identified in this area. Similar to that of Midden 2, no chicken or dog remains were identified (Table 35).

C. Wild

As described above, the domesticated species (NISP 9,191) outnumbered the wild species (NISP 3,927) by greater than a 2.3:1 ratio (Table 29). All molluscs and intrusive species, for example small, medium and unidentifiable rodents as well as most reptiles and amphibians were not included in the wild classification tables due to the non-relevant nature of the species to this portion of the data description.

When examined by area, the centralized zone of the Mound and Dung Areas contained over 94% of the wild assemblage, with NISPs of 1,049 and 2,670 respectively. The peripheral areas were very negligible in wild zooarchaeological material with the most abundant area being Midden 1, with a wild NISP of 88 (Table 38).

1. Wild distribution by secured horizon

The wild fauna at Ndondondwane amounted to a NISP of 2,450 when examined by secured horizons (Table 39). The largest portion of the wild zooarchaeological remains were recovered in the Middle Horizon with a NISP of 1,503 (61.4% of the total secured wild fauna), the Lower Horizon contained a NISP of 475 (19.4%), Upper 3a and Upper 3b Horizons had NISPs of 78 (3.2%) and 79 (3.2%) respectively. The Plough Zone Horizon held a NISP of 315 (12.9%).

Mammals were the most dominant class present in every Horizon with nearly 90% representation, with Pisces at 5.1%, reptiles at 3.1% and aves at 1.8%. Only the Upper 3a Horizon did not contain all the wild classes represented at Ndondondwane. There was not any aves nor reptile remains identified from this Horizon (Table 40).

2. Wild distribution by area and secured horizon

Due to the fact that the wild fauna at Ndondondwane consisted of 80 separate species and the skeletal representation for the majority of the species was miniscule at best (NISPs of between 2 and 10), only specific species will be described in this section. Consult Tables 38, and 39 for more detailed information on the species lists and NISPs for the entire wild assemblage distribution at Ndondondwane.

The general NISP counts for class and species, when not in affiliation with secured horizons appeared inflated (Tables 21 and 22). This is due to the inclusion of the wild zooarchaeological data that was recovered in non-distinct or blended horizons, as explained in a previous section of this chapter.

a. Dung Area

Overall, the Dung Area contained a NISP of 1,049 (Tables 38 and 41) with a NISP of 1,016 for mammals, while Aves (NISP 11), Pisces (NISP 12) and reptiles (NISP 10) were scarcely present. Of the more dominant wild mammalian species, all four *Aepyceros melampus* (impala) fragments identified at Ndondondwane were recovered from the Dung Area (three from the Lower Horizon and one from the Middle Horizon).

Furthermore, all five fragments of *Ourebia ourebi* (oribi) were identified from the Dung Area as well (one in the Lower, two Middle and two Upper 3a Horizons). *Sylvicapra grimmia* (common duiker) had a NISP of 12 in the Dung Area, (one in the Lower; 6 in the Middle; one in the Upper 3a; one in the Plough Zone and four in multiple Horizons). *Hippopotamus amphibious* (hippopotamus) and *Loxodonta africana* (African elephant) were both dominant with skeletal representation in the Dung Area with NISPs of 32 and 10 respectively. For the non-fully identified wild zooarchaeological material, Bovid Class 1, 2 and 3 (NISPs of 340, 67 and 465 respectively), *Canis* species (NISP 20) and Mammal-Very Large (NISP 23) were dominant categories from the Dung Area (Table 41).

The Secured Horizons present at the Dung Area are: 1. Lower; 2. Middle; 3a. Upper (abandonment); and 4. Plough Zone. No zooarchaeological remains were recovered from the Secured Horizons Upper 3b and the Surface. By Secured Horizon, the wild zooarchaeological material in the Dung Area amounted to a NISP of 970, with the bulk of the fauna recovered from the Middle Horizon (NISP 481) and the Lower Horizon (NISP 280) with a combined NISP of 761.

Within the Lower Horizon, the identified species included hippopotamus (NISP 8), elephant (NISP 3) and impala (NISP 3). The dominant sized class categories were Bovid Class 1 (NISP 46), 2 (NISP 92), and 3 (NISP 79) as well as Mammal-Very Large with a NISP of 20 and *canid* species (NISP 11). Non-diagnostic (to species) bird, fish and reptile remains were also recovered in low numbers from this Horizon (Table 41).

The Middle Horizon contained notable mammalian identified species including hippopotamus (NISP 12), elephant (NISP 7), common duiker (NISP 6), and Cape buffalo

(*Syncerus caffer* – NISP 2). The more abundant size class categories included: Bovid Classes 1 (NISP 69); 2 (NISP 120); and 3 (NISP 216) as well as *canid* species (NISP 7). crocodile (NISP 2) and monitor lizard (*Varanus sp.* – NISP 1) were the only notable species identified outside of the mammals class (Table 41).

3a. the Upper Horizon housed a NISP of 29 consisting solely of all mammals. The only identified species were the common duiker and oribi, both with a NISP of one. The most dominant category was the Bovid Class 3 with a NISP of 21 (Table 41).

Similar to that of the Upper Horizon, the Plough Zone contained few identified bone fragments. The identified species were the common duiker (NISP 1), hippopotamus (NISP 3) and monitor lizard (NISP 1). The most abundant size class consisted of Bovid Class 3 with a NISP of 122 (Table 41).

b. Mound Area

Possessing largest portion of the wild zooarchaeological assemblage at Ndondondwane (NISP of 2,653), the Mound Area also housed the most diverse list of individual wild species at 65. The bulk of the species list and NISP was identified from the mammals' class with 43 individual species and a NISP of 2,294 (Tables 38, 40 and 42).

The most notable mammalian species recovered from the Mound Area included, hippopotamus (NISP 1,313), elephant (NISP 550), and common duiker (NISP 25). This was the only area with steenbok (*Raphicerus campestris* – NISP 10); and giraffe (*Giraffa camelopardalis* – NISP 4) at the site. Furthermore, both the warthog (*Phacochoerus aethiopicus*) and bushpig (*Potamochoerus porcus*) were identified as well as 14 additional fragments of unidentified *suids*. Other notable, yet not fully identified species included: unidentified *felid* fragments (NISP 7), *canid* fragments (NISP 66 – plus 5 probable jackal fragments); as well as the Bovid Class 2 group as the most dominant of the Bovid classes with a NISP of 104 (Table 38).

The other wild classes from the Mound Area exhibited a combined NISP of 359, which included bird (NISP 47); fish (NISP 165) and reptile (NISP 147). For the complete list of species for each class in the Mound Area, see Tables 38 and 40.

Distribution of the zooarchaeological material from the Mound Area by Secured Horizon revealed that the Middle Horizon contained the highest number of bones and fragments with a NISP of 925. The Lower Horizon held a NISP of 150, while 3b Upper and Plough Zone Horizons contained NISPs of 79 and 135, respectively (Table 42).

The Lower Horizon contained several identified avian species, as well as fish and reptile (Table 42). The identified mammalian species included hippopotamus (NISP 65), common duiker (NISP 6), and blackbacked jackal (*Canis mesomelas* – NISP 2). Prevalent categories identified to size class were Bovid Class 3 (NISP 10), *canid* species (NISP 6) and *suid* species (NISP 5).

Species recovered from the Middle Horizon included hippopotamus (NISP 318), elephant (NISP 222), steenbok (NISP 9), and common duiker (NISP 9). Other notable wild mammals present in the Middle Horizon of the Mound Area were vervet monkey (*Cercopithecus pygerythus*), bushpig, warthog and rhinoceros. The most dominant size class category for the Middle Horizon was Bovid Class 2 (NISP 52) and *canid* species (NISP 35) (Table 42).

Identified species from the Upper 3b Horizon include hippopotamus (NISP 47), elephant (NISP 1), and giraffe (NISP 3). The lesser identified species categories, for example size class were all relatively low in number (Table 42).

The Plough Zone contained species such as hippopotamus (NISP 61), common duiker (NISP 3) and Nyala (*Tragelaphus angasi* – NISP 2). The most abundant size class consisted of Bovid Class 2 with a NISP of 24. An unusual amount of tortoise (NISP 9) was recovered from the Plough Zone as well (Table 42).

c. *Transect 1*

The wild fauna from Transect 1 amounted to a total NISP of 44, with 42 consisting of mammal and 2 avian. All the zooarchaeological material from Transect 1 was not fully identifiable and was sorted into size classes. The most dominant mammalian size class for the Transect 1 Area was Bovid Class 3 with a NISP of 21 (Table 46).

Transect 1 only contained zooarchaeological material in the Lower and Middle Horizons, with a combined NISP of 43. The bulk of the zooarchaeological material was recovered from the Lower Horizon (NISP 39) and contained mainly mammal fragments (NISP 37) identified to size classes. The most prevalent size class was Bovid Class 3 with a NISP of 20. The Middle Horizon held four Bovid Class 2 fragments. Nothing was recovered in the Upper Horizon (Table 46).

d. Transect 2

Similar to that of Transect 1, Transect 2 did not contain any fully identified wild fauna (Table 47). With a total NISP of 2, both identified as Bovid Class 3, Transect 2 held the least amount of wild zooarchaeological material from any identified area in Ndondondwane (aside from the Charcoal Preparation Area that did not contain any zooarchaeological material).

Transect 2 was utilized during the Lower Horizon and consisted of two Bovid Class 3 fragments. The Middle and Upper Horizons did not contain any zooarchaeological materials (Table 47).

e. Midden 1

Midden 1 contained a wild NISP of 88, with mammals representing the bulk of the assemblage at a NISP of 83. Bird (NISP 2) and fish (NISP 3) constituted the remainder of the Midden 1 assemblage. The majority of the mammals class were dominated by Bovid size class animals such as Bovid Class 1 with a NISP of 16, Bovid Class 2 (NISP 13) and Bovid Class 3 (NISP 30). Of the identifiable mammals from Midden 1 only *Hippopotamus amphibious* (hippopotamus) and *Phacochoerus aethiopicus* (warthog) were present, each with a NISP of one. The aves and pisces classes both contained unidentifiable fragments (Tables 38 and 43).

Midden 1 consisted of the Middle and the 3a Upper Horizons with an overall NISP of 88. The Middle Horizon contained mainly size class identified mammals with the most prevalent being Bovid Class 3 at a NISP of 20. The identified species included warthog, hippopotamus and hare, all with a NISP of one. The Upper Horizon contained all unidentifiable or size class identified mammals, with Bovid Class 3 (NISP 30) representing the bulk of the total NISP of 46 (Table 43).

f. Midden 2

Midden 2 did not contain any identifiable fragments of wild taxa. There was a total NISP of 81 and all derived from the Middle Horizon (Table 44). Almost all were mammals (NISP 80), but one fish fragment was present (NISP 1). Of the mammals, the bulk was identified as Bovid Class 3 (NISP 59).

g. Midden 3

Similar to Midden 2, Midden 3 had a NISP of 19. There were only two identifiable elements to a specific taxon *Crocodilus niloticus* - Nile crocodile) and a portion of a *Hippopotamus amphibious* (hippopotamus tusk Mammals dominated this part of the assemblage, with a NISP of 16. The Bovid Class 3 was the most dominant category. Fish (NISP 2) and reptiles (NISP 1) were the other groups present (Table 38).

Only the Middle (NISP 16) and 3a Upper abandonment (NISP 2) Horizons were identified at Midden 3. The Middle Horizon's only identified species was the crocodile fragment, while the most prevalent size class was Bovid Class 3 with a NISP of 7. The Upper Horizon only contained Bovid Classes 2 and 3 fragments with NISPs of one each (Table 45).

VIII. Skeletal element representation

The element representation for Ndondondwane consists of both domestic and wild species. Most of the mammalian species category that contained an overall NISP of more than 10 identifiable fragments was tabulated for this section (Tables 49 to 70). Intrusive species, such as rodents, are not included. The data was compiled by Horizon and Area, as well as a combination of both, to provide accurate spatial information across the site.

A. Domestics

1. Cattle (*Bos taurus*)

The total NISP of cattle at Ndondondwane was 2,593 (Tables 21 and 49). The distribution of cattle elements in NISP by Area were not the same between areas. The Dung Area had a NISP of 1,137 (43.9%), with various loose teeth fragments (NISP 170), cranial fragments (NISP 158) and vertebral fragments (NISP 107) as the most prevalent element types. Loose teeth (NISP 185), 1st phalanges (NISP 130) and cranial fragments were the most abundant element type represented at the Mound Area with a NISP of 1,216 (46.9%). Middens 1, 2, and 3 contained a combined NISP of 197 with loose tooth fragments the dominant element type. Vertebral fragments were also well represented in Midden 1. Transects 1 and 2 had a combined NISP of 43, with low counts in all element types. The centralized areas of the Dung and Mound Areas were almost equal in number of cattle fragments recovered. Combined, the central area amounted to almost 91% of the cattle assemblage at Ndondondwane, while the bulk of the peripheral area assemblage was located in Middens 1 and 2 (6.3%) (Table 49a).

The Secured Horizon NISP for the distribution of cattle elements is as follows: Lower – 565 (25.5%); Middle – 1,174 (52.9%); 3. Upper – 1 (0.05%); 3a Upper abandonment – 50 (2.3%); 3b Upper smelting – 59 (2.7%); and Plough Zone – 369 (16.6%). The Middle Horizon contained twice that of the Lower Horizon, with low NISPs in the top horizons – 3a and 3b Upper as well as the Plough Zone (Table 49b).

2. Sheep (*Ovis aries*)

The overall NISP of sheep at Ndondondwane was 1529 (Table 21), with dispersal of element representation by site area as follows: Dung – 397 (26%); Mound Area –

1,040 (68%); Midden 1 – 59 (3.9%); Midden 2 – 25 (1.6%); Midden 3 – 3 (0.2%); Transect 1 – 5 (0.3%); and there were no identified sheep fragments recovered from Transect 2. The bulk of the sheep zooarchaeological assemblage was recovered from the Mound Area. The excavations in the central area (i.e. the Mound and Dung Areas) amounted to 94% of the entire sheep assemblage at Ndondondwane (Tables 30b and 50).

The dominant element type represented in each area included: scapula in the Dung Area; 1st phalanx and scapula in Midden 1; femur and scapula in Midden 2; no dominant elements in Midden 3; radius and scapula from the Mound Area; and no dominant element representation existed for Transect 1 (Table 50).

The NISP counts for sheep by Secured Horizons are: Lower – 296 (24.5%); Middle – 651 (53.8%); 3a Upper – 43 (3.6%); 3b Upper – 61 (5%); and Plough Zone – 159 (13%). The Middle Horizon contained more than twice the sheep remains compared to the second largest assemblage of the Lower Horizon. Very few sheep fragments were recovered from the two Upper Horizons while the Plough Zone contained 13% of the assemblage (Table 51).

3. Goat (Capra hircus)

The goat NISP at Ndondondwane was 532 (plus 3 for the presence of dwarf goat elements) (Table 21). The distribution of goat by area of the site was: Dung – 176 (32.9%); Mound Area – 351 (65.6%); Midden 1 – 6 (1.1%); Midden 2 – 1 (0.2%); Transect 1 – 1 (0.2%). No goat remains were recovered from either Midden 3 or Transect 2. Furthermore, all 3 dwarf goat fragments were recovered from the Mound Area. The majority of the identified goat elements were recovered from the Mound Area and the central area contained almost the entire assemblage at 98.5% (Tables 21 and 52).

Through almost all areas of Ndondondwane, the 1st phalanx was the most common element identified. The innominate and scapula were also prevalent from the Mound Area (Table 52).

The NISPs for goat elements distributed by Secured Horizon were as follows: Lower – 112 (28%); Middle – 210 (52%); 3a Upper – 5 (1.2%); 3b Upper – 27 (6.7%); and Plough Zone – 48 (11.9%). The Middle Horizon contained more than half the entire goat assemblage at Ndondondwane, while more than one quarter was recovered from the Lower Horizon. Only 8% of the assemblage was found in the two Upper Horizons, while a further 12% was recovered in the Plough Zone (Tables 52 and 53).

4. Sheep/Goat (*Ovis/Capra*)

Due to the morphological similarities between the two species, it is a common practise in zooarchaeological analysis to create a third group for caprine skeletal remains that are not clearly distinguished as one species or the other. A NISP of 4,386 in the sheep/goat category represents a high total population of sheep and goats in the assemblage (Table 21). The distribution of sheep/goat elements in NISP and by Area at Ndondondwane included: the central zone of Dung Area – 1,818 (41.5%); and Mound Area – 2,263 (51.6%) As well as the peripheral zones of Midden 1 – 105 (2.4%); Midden 2 – 113 (2.6%); Midden 3 – 35 (0.8%); Transect 1 – 39 (0.9%); and Transect 2 – 12 (0.3%), in addition to a surface find of 1 from the Scrape 4 area. The central areas (Dung and Mound) contained 93% of the total sheep/goat zooarchaeological assemblage, while Middens 1 and 2 held the bulk of material in the peripheral zones (Table 54).

The most common element representation throughout the site was cranial, rib and loose tooth fragments. In addition, Midden 2 had an unusually large number of radii, similarly for the Mound Area with a high number of femora recovered (Table 54).

The distribution of sheep/goat elements by NISP and Secured Horizon was as follows: Lower – 950 (26.7%); Middle – 1,843 (51.7%); 3a Upper – 92 (2.6%); 3b Upper – 93 (2.6%); and Plough Zone – 583 (16.4%), as well as the single element from the surface. The Middle Horizon contained twice the amount of sheep/goat zooarchaeological material than the next largest assemblage in the Lower Horizon. Both the Upper Horizons (3a and 3b) were virtually equal in NISP (Table 55).

The sheep/goat data allows for accurate estimates on the amount of domestic small stock exploited at the site. This in turn demonstrates the degree of focus on the use of domesticates at Ndondondwane.

5. Dog (Canis familiaris)

Although not normally considered a contribution to the subsistence strategy of Southern African Iron Age sites, it must be considered that the dog was the workhorse of a mixed farming village or homestead. Herding of stock, protection of crops and the village itself was most likely among the daily activities. The NISP at Ndondondwane was 131 including 23 probable domestic dog elements (Table 21). The dog was only identified in two specific areas of the site, the Dung Area with a NISP of 35 (32%) and the Mound Area with a NISP of 73 (68%) (Table 56).

The Middle Horizon was the most abundant for the Dung Area, while more elements were recovered from the Lower Horizon at the Mound Area. Overall, the Lower Horizon contained the majority of the dog assemblage with a NISP of 39 (43%). The

Middle Horizon had a NISP of 29 (32%); the 3a Upper Horizon contained only 3 *canid* fragments (3.3%) and a NISP of 20 (22%) was recovered from the Plough Zone. No domesticated dog fragments were identified in the 3b Upper Horizon (Table 57).

The element type distribution was virtually uniform throughout the Areas and Horizons at Ndondondwane (Tables 56 and 57).

B. Wild species

1. Hippopotamus (Hippopotamus amphibius)

The hippopotamus was recovered in large numbers at Ndondondwane with an overall NISP of 1,347 (Table 29). Hippopotamus elements were found mainly in the centralized zones of the Dung Area with a NISP of 32 (2.4%), and Mound Area (NISP of 1,313 - 97.5%), with frugal amounts in the peripheral area of Midden 1 (NISP 1) and Midden 3 (NISP 1). No hippopotamus fragments were identified in Midden 2, or Transects 1 and 2 (Table 58).

Although loose tooth fragments were the most dominant element identified for the hippopotamus, large amounts of bone fragments associated with lower fore and hind limbs were also recovered (Tables 58 and 59).

The bulk of the hippopotamus zooarchaeological material from secure horizons (NISP 516) was recovered from the Lower (NISP 73 – 14.2%) and Middle Horizons (NISP 332 – 64%). There were no identified hippopotamus elements from the 3a Upper Horizon, and 3b Upper Horizon contained lower numbers (NISP 47). There was a slight increase in the amount of material from the Plough Zone Horizon (NISP 64 – 12%) (Table 59).

2. Afr<u>ican Elephant (Loxodonta africanus)</u>

Elephant zooarchaeological material at Ndondondwane provided a total NISP of 560. Almost all (NISP 559) were loose tooth (tusk) fragments. There was only one non-tooth element present associated with the elephant species, and it was a single rib fragment. All of the elephant fragments were recovered from the central areas, with the bulk of the material from the Mound Area (NISP 550 – 98%). No elephant remains were identified in the peripheral areas (Table 60).

With a NISP of 233 when examined by secured horizon, all but one fragment were deposited during the Lower (NISP 3 – 1.3%) and Middle Horizons (NISP 229 – 98.3%). The remaining elephant fragment was recovered from the 3b Upper Horizon (Tables 61).

3. Common Duiker (*Sylvicapra grimmia*)

The common duiker is a small antelope that stands 0.50 m tall and may weigh up to 20 kgs (Jacana 1997). With a NISP of 37, it was the most represented antelope species at Ndondondwane (Table 62). The elements were only recovered from the central areas of Dung (NISP 12 – 32.4%) and Mound Areas (NISP 25 – 67.6%). No other common duiker remains were identified in the peripheral areas (Table 62).

With a secured horizon NISP of 27, the bulk of the elements were found in the Lower (NISP 7 – 26%) and Middle Horizons (NISP 15 – 55.6%), while the remaining fragments were recovered from the 3a Upper Horizon (NISP 1) and the Plough Zone (NISP 4). No common duiker fragments were found in the 3b Upper Horizon (Table 63).

The element distribution was very uniform throughout the areas and horizons. The most represented element was the scapula, with four present in the Mound Area and three of which in the Middle Horizon (Tables 62 and 63).

4. Bovid Classes

The Bovid classification system refers to elements that are not identified to a specific species that matched mammals from the *Bovidae* family, for example African antelopes. The numerical value represents a size classification system, with 1 representing the smallest and 4 the largest Bovid.

a. Bovid Class 1

The Bovid Class 1 category refers to mammals that are small in stature and weigh 5 - 20 kgs, for example, the common duiker or oribi. A NISP of 397 (Table 21) was recovered throughout Ndondondwane with the bulk of the zooarchaeological material from the Dung Area (NISP 280 – 70.5%). The Mound Area contained a NISP of 63 (15.9%), while the peripheral areas held a combined NISP of 54. All Areas except Midden 3 contained elements identified as Bovid Class 1. The dominant element representations included vertebral and cranial fragments, as well as ribs and scapula (Table 64).

The Middle Horizon contained the majority of the Bovid Class 1 fragments with a NISP of 205 (54%) and the Lower Horizon held a NISP of 92 (24.1%). The Upper Horizons of 3a and 3b combined for a NISP of 22; while a NISP of 63 (17%) was recovered from the Plough Zone (Table 65).

b. Bovid Class 2

Bovid Class 2 represents mammals that weight between 20 and 110 kgs, with an average size of a fully grown sheep or goat, an example of wild bovids in this size class include the impala and springbok. The overall NISP was 626 (Table 21) with most of the zooarchaeological material recovered from the central areas, and located in the Dung Area (NISP 425 – 68%), with the Mound Area NISP at 153 (24%). The peripheral areas combined held a NISP of 48 while no identified Bovid Class 2 remains were recovered from Transect 2 (Table 66).

The elements most abundant in the assemblage included rib and vertebral as well as cranial fragments (Tables 66 and 67). The majority of the Bovid Class 2 material was recovered in the Middle Horizon (NISP 309 – 55.2%) and the Lower Horizon (NISP 163 – 29%) with few remains in the Upper Horizons (combined NISP of 14) and Plough Zone with a NISP of 74 (13.2%) (Table 67).

c. Bovid Class 3

The Bovid Class 3 category refers to larger mammals that weigh between 110 and 500 kgs, such as cattle. Examples include the kudu, nyala and wildebeest. At Ndondondwane, the NISP for Bovid Class 3 was 752 (Table 21) with the mass of the assemblage recovered from the Dung Area (NISP 536 – 71.3%). The Mound Area contained a low NISP of 76 (10%), while Midden 1 and 2 of the peripheral areas contained a combined NISP of 109 (14.5%). Midden 3, Transect 1 and 2 consisted of a few Bovid Class 3 fragments for a combined NISP of 31 (Table 68).

The elements most represented throughout the site were vertebral, rib and cranial fragments (Table 68) with a combined NISP of 384.

Much of the deposition of the Bovid Class 3 zooarchaeological material occurred during the Middle Horizon occupation with a NISP of 360 (51%). The Lower Horizon was found to contain almost one third of the Middle Horizon (NISP 131 – 18.6%), while Upper Horizon 3a was found to hold a NISP of 53 (7.5%) and 3b carried a NISP of 4. The Plough Zone was found to contain a large amount of material with a NISP of 155 (22.1%) (Table 69).

d. Bovid Class 4

Bovid Class 4 represents very large mammals that weigh between 500 and 900 kgs such as the Cape buffalo and eland. The material was only recovered from the Dung Area, Midden 2 and the Mound Area, with the majority of the NISP of 28, shared almost equally in the central areas, between the Dung and Mound Areas (NISP 13 and 11 respectively), while Midden 2 contained the last 4. Bovid Class 4 material was found in all Horizons at Ndondondwane, with a slight increase during the Middle Horizon (Tables 21 and 71). Element representation appeared fairly uniform except a single peak with rib fragments (Figure 71).

IX. Osteometrics

Osteometrics refers to the measurement of all complete elements or specific measurable fragments of elements. Due to the high level of fracture from the entire zooarchaeological assemblage at Ndondondwane, very few elements were recovered complete, although several elements possessed complete sections that were measured following von den Dreisch's (1978) *Guide for Measuring Animal Bones*.

A total of 125 complete or measurable fragments of elements were measured from Ndondondwane, all but one element was recovered from the Dung Area while Midden 1 contained the other measurable element (Table 72). This is indicative of the higher level of preservation in the Dung Area than other parts of the site.

Sheep were the most represented species by osteometrics with a NISP of 46; cattle were second with a NISP of 24; then goats with a NISP of 19 and sheep/goat with a NISP of 18. The most represented of the wild fauna was hippopotamus and common duiker both with a NISP of 3. The elements that were most commonly measured were the scapula, metapodial and astragalus (Table 72).

X. Harvest profiles (age at death)

Determination of age at death (harvest profiles) for specific species at Ndondondwane allows for the comprehension of herd management strategies. The frequency of age distribution of domestic species presumably reflects selective choices made by the inhabitants of Ndondondwane on which products they required from the herds (primary – meat, hide or secondary – milk, wool). The age at death is assumed to be due to intentional culling strategies, although it is likely that individuals in the assemblage may have died by other means (disease, malnutrition) not detectable through analysis. Since alternative types of death for domesticates is unknown, all elements age identified are included in the harvest profiles.

A. Domestics

The domesticated animals as a group amounted to a NISP of 6,298 that were identified to an age category. A NISP of 1,314 were recovered from the Lower Horizon, while a NISP of 2,882 were located in the Middle Horizon (Tables 73, 73b and 74). The age category of subadult/adult was removed from certain tables for a refined analytical process. This is due to the overlapping nature of the age category that may create overrepresentation of specific ages at death.

1. Cattle

A total of 1,990 cattle fragments were identified to age at Ndondondwane. As a whole, cattle were found to be most represented as adults (NISP 686) and subadult/adults (NISP 477) than the remaining age groups combined (Table 73 and 73b).

When examined by horizon, adults and subadult/adults were the most abundant age groups in the Lower Horizon with NISPs of 135 and 111, respectively and the Middle Horizon with NISPs of 364 and 236, respectively (Table 74).

The Dung Area and Mound Area, which are the basis for the central zone of Ndondondwane, were the most prevalent areas for identified age groups for cattle. The adult age category was the largest for both areas with a NISP of 398 for the Dung Area and 208 for the Mound Area (Table 76). The juvenile age group in the Mound Area (NISP 203) was almost equivalent to the adults.

When examined by secured horizons and percentages, an indication of the slaughter pattern emerged. Very little foetal and infant remains were identified, but by the juvenile stage over 20% of the cattle population were slaughtered (26.5% in Lower Horizon – Table 75a and 20.7% in Middle Horizon – Table 75b). By the subadult age a further 26.5% of the cattle population were culled in the Lower Horizon and 28.2% in the Middle Horizon. Therefore, prior to adulthood, 56.4% of the cattle were culled in the Lower Horizon and 50.3% in the Middle Horizon (Tables 75a and 75b and Figure 6.1). This represents the intentional strategy to allow nearly half of the cattle herds to survive past the optimal age for human consumption.

2. Goats

Only 492 goat fragments were afforded an age category from the Ndondondwane assemblage. The overall counts demonstrated that 41.7% of the goats were culled at the adult stage of life. Beginning with the juvenile category (NISP 55), each consecutive age group nearly doubled in NISP, i.e. subadult NISP 112 and adult NISP 205 (Table 74).

All but 8 identified goat fragments originated from the central zone of Ndondondwane, the Dung (NISP 130) and Mound (NISP 243) Areas. Both of these areas demonstrated a parallel pattern of increase between the numbers of goats killed to the aging population (Table 77). This trend is further reflected in the Lower and Middle Horizons, where the quantity of culled goats increased in direct context to the increase of age groups (Tables 75a and 75b).

When examined by secured horizon, the Lower Horizon exhibited the tendency to slaughter 53.8% of the goat population before reaching the adult stage of development (Table 75a). While only 42.7% of the goat population was culled prior to adulthood in the Middle Horizon (Table 75b).

3. Sheep

A NISP of 1,232 sheep bone fragments were categorized into an age category. The age classes with the largest NISP for sheep was adult (385) followed by subadult (326). When compared to cattle where the NISP increased more dramatically as the age reached adulthood, sheep culling numbers increased sharply between the juvenile and subadult stages, then a gradual increase into adulthood (Table 73). These results are visible by secured horizon where on average there are larger numbers of sheep culled prior to adulthood (Table 74).

When combined, the central areas consisting of the Dung and Mound Areas contained almost 94% of the entire sheep assemblage categorized to an age group. The Dung Area exhibited a spike in sheep culling at the subadult age range that decreased slightly into adulthood. A similar trend was found in Midden 2. Conversely, the Mound Area demonstrated a gradual increase of culled sheep between the subadult and adult age ranges, comparable to the findings from Midden 1 (Table 78).

By secured horizons the sheep culling patterns demonstrated that 65.3% of the sheep assemblage was harvested prior to adulthood in the Lower Horizon (Table 75a). The Middle Horizon showed that 61.2% of sheep were culled before the adult stage of life (Table 75b).

4. Sheep/Goats

The combined caprine group contained a total NISP of 2,584, the largest of all domestic species. The most prevalent age category present for sheep/goats was the juveniles with a NISP of 729, while the subadults (NISP 510) and adults (NISP 520) were almost equal in quantity (Table 74). The harvest pattern for the combined caprine category was not congruent with either the sheep or goat patterns described above. One probable reason is that younger caprines possess little identifying markers and are less distinctive as to specific species (sheep or goat). These caprines are then more likely to be placed in the combined category of sheep/goat, whereby creating an over-representation of the juvenile age group. Therefore caution must be used when examining the sheep/goat data for harvest profiles.

Similar to that of the other domestic species, the majority of the sheep/goat assemblage assigned an age category originated from the Dung (NISP 1,374) and Mound

(NISP 967) Areas. Middens 1, 2 and 3 contained the bulk of the sheep/goat assemblage from the peripheral areas with a NISP of 198. The slaughter pattern for the Dung Area did not fluctuate between the juvenile and the adult age categories, with totals averaging at 22% (when disregarding the subadult/adult category) (Table 79).

By secured horizon, the Lower Horizon exhibited a slaughter peak at the juvenile stage while the Middle Horizon displayed a slaughter spike at the adult age category (Tables 75a and 75b).

B. Wild

A total NISP of 1,202 wild fragments were identified to an age category. The majority were mature individuals (NISP 838); either subadult/adult (NISP 412) or adult (NISP 426). The most commonly represented mature wild species were the hippopotamus (NISP 92) and the common duiker (NISP 24). Bovid Class 1 (NISP 103); Bovid Class 2 (NISP 208); and Bovid Class 3 (NISP 326) were the most prevalent mature size class mammals present at Ndondondwane (Table 79a).

XI. Sexing

The high level of fracture and other taphonomic agents on the zooarchaeological material from Ndondondwane proved difficult with sex identification of the assemblage. Only 330 elements possessed enough indicators to provide sex identification. In addition to cranial and pelvis fragments used for sex determination, other elements exhibiting extreme robusticity and enlarged muscle attachments were used as indicators for male sexual dimorphism.

A combined NISP of 313 elements were identified to sex within the domesticate category. Of the 55 identified cattle fragments, 19 were determined as female (or probable female) and 36 as male. Of 141 sheep, 60 were identified as female and 81 male. Also, 22 female and 30 male goats were identified. The combined sheep/goat category had 65 individuals identified to sex, one castrated male, 24 female and 40 male (Tables 73c and 80).

From the wild fauna, 12 males and 5 females were identified. The species were widespread with Bovid Class 2 and suid as the only classes with more than one individual determined to sex (Tables 73c and 80).

XII. Taphonomy

Taphonomic processes refer to zooarchaeological assemblage attrition induced by both pre-depositional activities (cut and chop marks, breakage during processing, burning) and post-depositional activities (rodent and carnivore gnawing, weathering, farm implement damage, excavation damage).

A. Pre-depositional activities

Assessment of alteration and modification of the zooarchaeological assemblage by human activity prior to discard assists in determining butchery practices as well as types of food processing and preparation.

1. Butchering

A total of 1103 bone and bone fragments exhibited some form of butchering such as chop marks, slice marks or impact marks. Cattle displayed the highest number of elements with evidence of butchering at 268, while the combined caprines (sheep and goats) had a total of 243 bones. The taxon with the largest total of worked butchered among the wild fauna was the hippopotamus with a NISP 15. Several bones exhibited butchering marks indicative of disarticulation (Table 81).

The Mound Area contained the most butchered remains with a NISP of 593, while the Dung Area held the second most abundant with a NISP of 445 (Table 81). In total, 2.3% of the entire zooarchaeological assemblage at Ndondondwane exhibited evidence of butchering (Table 82b). The majority of the butchered remains were recovered from the Middle (NISP 434) and Lower Horizons (NISP 273) (Tables 82 and 82b).

B. Post-depositional activities

Identification of taphonomic influences on a zooarchaeological assemblage after discard aids in factoring the causes of bone degradation and the high percentage of unidentifiable bone fragments recovered at an archaeological site.

1. Burning

Although commonly occurring at the time of deposition, burning was better suited to be grouped into post-depositional activities due to it being the end result of other activities such as food preparation, roasting and choice of placement for deposit. The zooarchaeological material that exhibited evidence of burning amounted to a NISP of 2,642 fragments. The bulk of the burned material was either charred black (NISP 1,555) or calcined white (NISP 424), both demonstrating the existence of prolonged direct exposure to high heat and flame (Table 82).

The Dung Area contained the bulk of the burnt bone fragments with a NISP of 1,347. Charred bone (black) represented the majority of the burnt assemblage with a NISP of 947, while only 98 fragments exhibited calcined (white) damage. A NISP of 543 burnt bone fragments were recovered from the Mound Area. The majority of which were categorized as "burned". This was the level of identification by Voigt and von den Driesch (1984) for burnt material from the Mound Area and therefore had to be incorporated into the data-set as such. Of the peripheral areas, Middens 1, 2 and 3 contained the bulk of the burnt material, with a NISP of 707. The mass of this assemblage was charred black (NISP 415) or calcined (NISP 284) (Table 83). The majority of the burnt material was recovered from the Middle Horizon (NISP 1,425) with 892 identified as charred black (Table 84).

2. Weathering

Levels of weathering assist in determining rates of preservation across the site. In general, 49.2% of the assemblage exhibited evidence of heavy weathering, while 31.9% was moderate, 18.2% was light and 0.7% was pristine in preservation (Table 85).

When examined by secured horizon, the 3 Upper and Plough Zone contained the highest percentages of heavy weathering throughout the site (94% and 78% respectively). The Lower Horizon and Middle Horizon (42% and 47% respectively) demonstrated reduced evidence of taphonomic processes while Upper Horizons 3a and 3b contained the least amount of heavily weathering with 25% and 2% respectively. Please note that very little material was recovered from these two horizons overall (Tables 85 and 86).

3. Carnivore and rodent gnawing

Damage to a zooarchaeological assemblage by carnivore and rodent activity is a common occurrence in the archaeological context. Quantifying the level and instigator of the damage to the assemblage reduces the level of taphonomic bias present during zooarchaeological analysis.

A total of 966 bone fragments exhibited evidence of carnivore and/or rodent gnawing damage at Ndondondwane. The domestic species amounted to a NISP of 726 (75.2% of the gnawed assemblage); with 316 identified cattle, 406 caprine and 4 dog elements (Table 89). The majority of the identified wild species damaged by gnawing included hippopotamus and monitor lizard. Most of the remaining gnawed assemblage was assigned to a size class (Table 89).

Of the 800 bone fragments from secured horizons that exhibited gnawing activity, 207 were recovered from the Lower Horizon and 382 from the Middle Horizon. The Upper 3a and 3b Horizons contained 46 fragments and the Plough Zone held 165 (Table 88).

Overall, 78% of the gnawed assemblage exhibited evidence of rodent activity while 22% demonstrated carnivore presence (Table 87).

4. Fragmentation

Levels of fragmentation represent survivability of bone elements against all taphonomic influences over time. This is measured by assigning a numerical value to the average size of an element at the time of analysis, for example, a complete bone is assigned a numerical value of 1; more than three quarters of an element is 2; half equals 3; to chipped fragments of unidentifiable bone (splinter) possessing a numerical value of 7. When quantified, the average levels of fragmentation found throughout the site assist the analyst in determining the stages of zooarchaeological assemblage preservation and further effects of taphonomic processes on the bones themselves.

a. Fragmentation by activity area

The Mound Area of the central activity zone contained the highest percentage of complete bones throughout the site at 9.3%. Midden 1 in the peripheral zone contained 3.7% complete elements. The site average for complete bones was 4.9%. Overall, the Mound Area was well above average for accumulation of larger fragments than any other area at Ndondondwane. The Dung Area and Midden 1 also exhibited better than average preservation. Midden 3 and Transect 2 demonstrated the poorest bone preservation in context to fragmentation with 95.3% and 94.7%, respectively of their assemblages consisting of less than one quarter of an element present (Table 89).

b. Fragmentation by horizon

When examined by secured horizon, the data exhibits a relative uniform level of element fragmentation for each horizon. On average, between 8% and 11% of the elements were recovered at half its original size or larger, while between 80% and 93% were recovered at less than a quarter of the original size. The only anomaly was the 3b.Upper Horizon where 38.5% of the assemblage analyzed consisted of half the size of an element or larger, while only 35.5% of the assemblage was less than one quarter of the original size (Table 90).

In general, an overall uniform fragmentation pattern existed between horizons and areas at Ndondondwane. As the deposition became shallower, the frequency of smaller bone fragmentation increased. The Mound Area and Midden 1 did contain a slightly higher average of larger bone fragments when compared to the remainder of the site.

XIII. Cultural modification of bone, shell and ivory

Modified bone, shell and ivory in the form of tools and adornment are common finds at EIA sites throughout KZN (Voigt and Peters 1994: 113) and were recovered from Ndondondwane. Overall, a small percentage of the assemblage exhibited evidence of modification (NISP 369), while a further NISP of 136 did not show any sign of modification, but did possess evidence of use through the presence of polish (Tables 91, 92 and 93). Bone tools and adornment were mainly located within the central area of the site (Dung and Mound) with a NISP of 360 (Mound NISP 272; Dung NISP 88). The remaining nine modified elements were scattered amongst Midden 1 (NISP 6); Midden 2 (NISP 2) and Transect 1 (NISP 1) (Tables 93 and 81). Furthermore, the bulk of the bone modification was recovered from the Middle Horizon (NISP 97 - 59% of the assemblage). Much of the remaining bone, shell and ivory fragments were found in the Lower Horizon. Very little was recovered in the Upper Horizons.

Link shafts and points (NISP 164; 44.44%) consisted of the bulk of the tools recovered. Furthermore, awls were quite abundant with a NISP of 37 along with eyed needles, scoops and bone handles. Also, worked ivory fragments (NISP 1569) and arm bangles (NISP 45) were recovered in large amounts.

XIV. Conclusion

This chapter described the results of the extensive zooarchaeological analysis applied to the assemblage from Ndondondwane. Zooarchaeological analytical processes were addressed including frequency and distribution of the entire zooarchaeological assemblage by spatial and temporal factors. Furthermore, in-depth examination of animal species present; domestication ratios; element representation, aging and sexing identification and profiles; and taphonomic processes of both pre and post deposition were all completed.

The total assemblage amounted to a NISP of 47, 048 bones, shell and fragments, of which 18,487 (39.3%) were identifiable to a relatively fine taxonomic level. In terms of spatial distribution, almost 82% of the assemblage was recovered from the central zone of Ndondondwane (the Dung and Mound Areas) with the remaining 18% located within the peripheral areas. A very large number (n=88) of domestic and wild species were recognized within the massive assemblage. The vast majority of remains belonged to domestics, with the combined sheep and goat taxa dominating the assemblage.

Chapter 7: Analysis of Data from Ndondondwane

I. Introduction

Analysis and interpretation of the zooarchaeological data from Ndondondwane not only involves examination of the processed data, but requires a knowledge and resource base that transcends zooarchaeology in order to attempt to comprehend daily activities at a complex site such as Ndondondwane. The purpose of this chapter is to test the original research questions and hypotheses presented in Chapter 1 against the zooarchaeological data presented in Chapter 6 in conjunction with ethnographic herding practise information discussed in chapter three. Each question will be listed individually with corresponding interpretations in each section. The second part of this chapter examines the taphonomic data from Chapter 6 and discusses its effect on the any interpretations that one can make about the zooarchaeological assemblage from Ndondondwane.

II. Qualification of research questions

The following section addresses the research questions and objectives that were outlined in the first chapter utilizing the analyzed zooarchaeological data from Chapter 6. The answers to the research questions will contribute to increased comprehension of EIA subsistence strategies in KZN. Each research question will be presented, as it was in Chapter 1, with corresponding information to satisfy that question in the following paragraphs.

A. Research question 1: Was the community of Ndondondwane more reliant on domesticated animals or were wild animals the primary protein source?

To answer this question, the zooarchaeological data had to be quantified using NISP with sums and percentages compared by type of domestication (domestic versus wild) as well as gross counts of each species present. All molluscs and potentially intrusive species, such as most rodents, reptiles and amphibians, were not included in the wild category. These were considered as non-food or ceremonial contributions to the taxa at the site.

The identified domesticated species amounted to a NISP of 9,191, while the number of identified wild species totalled 3,959. The wild NISP included 1,010 hippopotamus and 559 elephant ivory fragments. These fragments have no correlation to subsistence strategies since the ivory was collected for creation of tools and adornment, not for food. Therefore, the ivory fragments were removed from these calculations and a new total wild NISP of 2,390 was calculated.

The domestic taxa of Ndondondwane outnumbered the wild by a ration that was 2.3:1 with ivory and a 3.8:1 ratio with ivory removed from the equation (Table 29). The more realistic ratio of the relative importance of potential food taxa is the one without ivory.

Even though a domesticated stock far outnumbered wild taxa in the overall zooarchaeological assemblage, the high diversity (in spite of their low individual frequency) of wild species found within the confines of Ndondondwane demonstrates that the inhabitants did not focus on solely consuming their domesticates. It is likely that the occupants ventured out to collect exotic game in order to expand their menu options or for particular ritual needs. The deficiency of wild skeletal part abundance in the assemblage may not be due to the lack of a continued hunting strategy, but rather the hunters need to "lighten" the carcass at the kill site in order to be able to haul the meat back to the settlement. This concept was introduced by Perkins and Daly (1968) as the Schlepp Effect (to drag). This essentially means that in order to carry or "schlepp" the premium sections of a killed wild animal back to the settlement, the hunters would remove and discard the least important parts of the animal (heavy bones with least amount of usable meat) to make the carcass more portable. This theory also discusses the likelihood that the farther the distance of the kill site from the settlement, the lighter the load may need to be, therefore less number of bones will be carried back with the carcass (Lyman 1994: 224).

For an indication that Ndondondwane hunters were reducing the weight of a carcass prior to returning to camp, a larger percentage of the core elements should be present in the assemblage than less premium sections of the carcass. For example, core elements will include: upper limb long bones (femur, humerus); vertebra (especially thoracic, lumbar and sacral); ribs; scapula and innominates. This would apply more for the larger hunted species that would require disarticulation over that of the smaller sized animals that could be transported whole.

Due to the high level of bone fragmentation and weathering (taphonomic processes) at Ndondondwane, an accurate calculation of element frequency of wild species was not possible. Of the few identifiable wild fragments from the zooarchaeological assemblage of Ndondondwane, there is some indication that the schlep effect was plausible. For example, two (66%) of the three fragments of Cape buffalo recovered at the site were core elements (femur and scapula), the third was a radius fragment. From the *equids*, three (75%) of the four fragments were core elements (femur, humerus, innominate) while the fourth was a metapodial. The mountain reedbuck assemblage amounted to 62.5% core elements (innominate (2), femur, vertebra and scapula). Conversely, both identified fragments of the nyala were non-core elements as well as 60% of oribi. A larger sample of identifiable elements from larger wild species would be necessary to gain a better understanding if the schlepp effect was present at Ndondondwane.

The Schlepp effect is often made useless when there is severe attrition in the assemblage due to taphonomic processes. The very fragments often seen appearing in schlepped assemblages are those that preserve best (e.g. denser and early fusing elements). As demonstrated above and in Chapter 6, there is little evidence for differential attrition. Hence, the inhabitants were clearly selecting for higher quality and meatier portions from the wild game and were discarding the meat-poor elements.

Therefore, the inhabitants of Ndondondwane would appear to be most reliant on their domestic stock, at a ratio of almost 4:1. Wild fauna did represent 25% of the identified assemblage, demonstrating that it constituted a small, but important component of the subsistence strategy.

B. Research question 2: a) If domestic animals were the primary source of meat, was subsistence specialized or generalized?

To determine if a specialized or generalized subsistence economy was utilized at Ndondondwane, taxonomic diversity must first be established. If the economy at Ndondondwane was specialized, there should be a high concentration of a single specific domesticate taxa (i.e. cattle) identified within the zooarchaeological assemblage. Conversely, if a generalized subsistence economy is present at Ndondondwane there would exist a taxonomic diversity of domesticates intermixed with a variety of wild specimens in the assemblage (Cruz-Uribe 1988: 179; Schmitt and Lupo 1995: 496).

The dominant domestic species present at Ndondondwane were cattle, sheep, goats and the indeterminate caprine grouping of sheep/goat. Less well represented are domestics, such as dog and chicken. Cattle were the most common individually identified domesticate with a NISP of 2,593, while sheep (NISP 1,529), goats (NISP 535) and the indeterminate sheep/goat (NISP 4,386) were the most abundant domestic grouping of caprines with a combined NISP of 6,450 (Table 29). Therefore an estimated overall small stock to cattle ratio of 2.5:1 existed at Ndondondwane. In order to estimate the NISP of sheep and goats present at the site and eliminate the indeterminate sheep/goat category, it was determined that the identified goat fragments amounted to 28.5% of the total amount of sheep fragments. Therefore, it can be concluded that 71.5% (NISP 3136) of the indeterminate sheep/goat assemblage can be classified as sheep, while 28.5% (NISP 1250) would consist of goat. If so, then sheep comprise a NISP of 4,665 and goat amount to a NISP of 1,785. From the modified caprine calculations, the dominant domestic species at Ndondondwane consisted of sheep with a NISP almost twice that of cattle.

Therefore, domestics far outnumber wild fauna by a ratio of 3.8: 1 and sheep are the most dominant domestic species present at the site. Cattle consist of more than half the number of sheep. Therefore, it can be deduced that the inhabitants of Ndondondwane practised a generalized herding economy.

b) Domestic animals were exploited for which products (primary: meat, bone,

and/or secondary: milk, wool)?

Harvest profiles otherwise known as age-at-death profiles assist the analyst in determining the nature of exploitation of the domestic species from Ndondondwane. Harvest profiles quantify the age at time of slaughter for each domestic species. The aging profiles are often complemented with sex identification for more accurate analysis to determine type of product exploitation (Davis 1993; Greenfield 1988; Payne 1973).

Specific frequencies of domestic species sex and age at death distribution assist in ascertaining herd management practices such as selective culling patterns that may be based on seasonality, or aging (Ritz and Wing 1999: 179). Epiphysial fusion rates and tooth eruption sequences were used to accurately identify age at time of death.

Only the species that could be identified to the species-level of taxonomic identification were used for the calculation of harvest profiles - the three domestics of cattle, sheep and goats. The data from indeterminate sheep/goats must be used cautiously due to an identification bias of juvenile caprines. Younger caprines are more difficult to differentiate between sheep or goat, and were therefore disproportionately grouped into the indeterminate category of sheep/goat. This in turn creates a dramatic over-representation of juvenile caprines which causes a spike in the harvest profile that may skew the other data. Therefore, the spike of juveniles within the sheep/goat category must be noted, but caution on possible bias is recommended. The data in Tables 74 and 75 present the percentages of all age data, including subadult/adults. However, these data are not considered useful in this context and the data are recalculated after the indeterminate category was deleted (Tables 75a and b).

1. Cattle

When calculated by secure horizon, cattle in the juvenile stage demonstrated a culling pattern of over 20% (26.5% in Lower Horizon – Table 75a and 20.7% in Middle Horizon – Table 75b). A further 26.5% of the cattle population were culled by the subadult stage in the Lower Horizon and 28.2% in the Middle Horizon. Therefore, prior to adulthood, 56.4% of the cattle were culled in the Lower Horizon and 50.3% in the Middle Horizon (Tables 75a and 75b and Figure 6.1). Throughout the entire site, over 54% of the cattle population were culled prior to adulthood (Table 73b and Figure 3).

Sex determination for cattle was based on horn cores, innominates, and other sexual indicators. However, there were very few identifiable fragments. From the data that was compiled, 86% of the juvenile and subadult cattle population that could be identified as male. The ratio was virtually uniform between males and females at the adult stage (Table 73c). This suggests that the focus was to maintain a breeding population by selectively culling most of the males at a younger age and keeping the females alive into adulthood. The culling ratio was expected to be higher for the females during the adult stage, but the resultant drastic increase of culled females demonstrates the change in pattern as the cattle population aged.

This demonstrates a relatively biased culling pattern with an emphasis upon males up to the adult stage (probably for meat exploitation), during which the intention changes to herd maintenance - to keep a large portion of the herd alive. If the focus of exploitation for young cattle was meat based, then the expected harvest profile would indicate a drastic increase in mortality at the subadult stage. Subadults have reached the optimal size and weight for slaughter for meat (Payne 1973).

2. Goats

When frequencies are calculated by secure horizon, the Lower Horizon exhibited an emphasis on adults, with 46.1% of goats culled as adults (Table 75a). The proportion of adults dramatically increases in the Middle Horizon, with 57.3% (Table 75b). The culling pattern for goats from all contexts and periods across the site intermediate between that of the Lower and Middle Horizons with 53.9% of the population slaughtered as it reaches the adult stage (Table 73b and Figure 3).

Analysis of culling patterns by sex determination revealed that only 18% of the male population were slaughtered prior to adulthood, though 82% of the males were slaughtered as adults (Table 73c).

Overall, the culling pattern for goats at the site is below the average for domesticates during the pre-adult stages. This demonstrates an effort of maintaining older individuals in herds for purposes other than meat. The likely reason is that they were used for milk (cf. Greenfield 1988; Payne 1973).

3. Sheep

When examined by secured horizons, the sheep culling patterns demonstrated that 65.3% of the sheep assemblage was harvested prior to adulthood in the Lower Horizon (Table 75a), while 61.2% of sheep were slaughtered before the adult stage of life in the Middle Horizon (Table 75b). On a whole, almost 60% of the sheep population were culled prior to adulthood (Table 73b and Figure 6.3). A large increase occurred at the subadult age category with almost 35% of the population slaughtered (5% more than the domestic average).

When analyzed by sex determination, 76% of the slaughtered pre-adult population were male. During adulthood, the culling pattern was more uniform, with 53% being female (Figure 73c).

With 60% of the sheep population culled before adulthood and a large portion culled at the subadult stage, the subsistence strategy for sheep is focused on meat exploitation (Greenfield 1988; Payne 1973).

4. Sheep/Goat

With the sheep/goat category, almost 72% of the population was slaughtered prior to adulthood. Furthermore, the tables demonstrated a large increase at the juvenile culling stage at 40% of the population (10% higher than the overall average – Table 79). The results appear to correspond to the general sheep culling pattern described above. Furthermore, when it is realized that most likely 71.5% of the sheep/goat assemblage represents sheep and 28.5% goats, the culling patterns of younger individuals remain high for the sheep population. Further reinforcing the meat based economy for sheep mentioned above.

In summary, the harvest profiles revealed that younger populations of cattle and goats were culled at a lower rate than sheep at Ndondondwane. This suggests that sheep were primarily used for meat while cattle and goats were used for secondary products (Greenfield 1988; Payne 1973).

c) Did the occupants of Ndondondwane rely most on primary or secondary products from their domestic herd?

This research question is a second part to Question 2b above. It delves deeper into the interpretation of the harvest profiles. In order to determine what the main form of economy was at Ndondondwane, overall ageing and sexing groups had to be determined, then fit into an age and sex grouping that is associated with a culling pattern for primary or secondary products.

As was determined in Question 2b above, pre-adult cattle and goats were culled at a much smaller rate than that of sheep. The highest rate of age at death for sheep was at the subadult stage where 35% of the population was culled. According to Payne (1973: 282) this is the optimal age to cull a herd when the primary product of meat is the focus.

The higher culled percentage of adult aged cattle and goats is indicative of more than a meat based economy. With the goat population, 60% of the herd lived into adulthood demonstrating a focus on secondary products. The inhabitants of Ndondondwane placed goats in higher regard than sheep for these secondary products, which most likely was milk. Normally, a further indicator of a milk-based economy for a specific herd was an increase in mortality of females after adulthood, oddly this was not found at Ndondondwane (likely due to a sampling bias) where slaughtered males increased in number over that of females into adulthood (Figure 73c).

The cattle culling patterns differed slightly from that of the goat. By adulthood, only 46% of the population remained, demonstrating a mixed strategy. At Ndondondwane, cattle were slaughtered at a higher rate than goats in the pre-adult stages of life, yet a large portion of the herd is maintained past the optimal age indicative of a meat-based economy. From this evidence, cattle were exploited for both a meat- and milk-based economy.

Upon close examination the question arises as to why would the occupants of Ndondondwane cull older cattle when the obvious emphasis was on younger (and more delectable) sheep? Ethnographic research (chapter 3) has demonstrated that cattle are deeply immersed in many facets of cultural and ceremonial activities of numerous Eastern and Southern African herding societies.

Chapter 3 introduced typical ethnographic herding patterns of various African cultures with similar herding strategies to that of Ndondondwane. Many of the cultures held cattle in high regard, deeply entwining cultural belief systems and ceremonial practises with cattle herding strategies. In context to Ndondondwane, the irregular ratio of cattle culling patterns when compared to sheep and goats is due to the common slaughter practises for ritual and/or ceremonial events. The Shona of Zimbabwe would slaughter cattle during specific ceremonial practises, for example: the ritual sacrifice of cattle (usually a bull) provided to a mother whose daughter is about to be married; the conclusion of a burial service as the mourners return to the village; a wedding ceremony; or when an important and respected person visits a village (Gelfand 1971: 126-127; Thorp 1995: 71). Therefore, consumption of older cattle was accomplished by conscious choice. Essentially, the slaughter patterns of older cattle at Ndondondwane were the likely result of feasting practises during ritual and ceremonial activities.

Therefore, through interpretation of harvest profiles of the domestic species consisting of cattle, sheep and goats, it has been determined that sheep were exploited for a meat-based economy, goats were utilized primarily for milk or other unknown secondary products and cattle were exploited for milk and meat (on a ceremonial feasting level). Overall, this would provide the occupants of Ndondondwane with a well balanced subsistence strategy, purposely and efficiently exploiting all of its main domestic resources.

C. Research question 3:

a) Did the occupants of Ndondondwane pursue a mixed hunting and fishing strategy among the wild animals that was a reflection on the diverse availability of the fauna in the wild?

When a wide diversity of food resources is found available in the surrounding region of a settlement, it is assumed that the local human population would attempt to exploit the maximum yield possible for continued sustenance and menu variety. With Ndondondwane located adjacent to the Thukela River, access to aquatic fauna such as fish was available. Furthermore, the territory around the site sustained a wide variety of mammalian species that would offer a diverse menu.

To determine if fishing occurred at Ndondondwane, examination of the taxonomic inventory (especially species identification) with frequency of occurrence was conducted. From this taxonomic list it can be determined the presence of wild fauna choices for sustenance and conversely, what wild fauna were known to be present and disregarded as a food source. Through zooarchaeological analysis, a NISP of 186 fish fragments were recovered throughout Ndondondwane; this amounts to only 0.4% of the entire assemblage. The majority of the fish bones were located in the Mound Area (NISP 169). The bulk of the fish assemblage was deposited in the Middle Horizon with a NISP of 91 (Tables 6.26 and 6.39). Although some fish remains were recovered from Ndondondwane, at 0.4% of the entire assemblage it can be determined that fish were not intensively exploited as part of the subsistence strategy.

A common misconception is that a collection bias may have slightly altered the recovery process during the excavation by Greenfield and van Schalkwyk (1995-1997).

The use of dry sieves with 0.5 cm square (1/4 inch) mesh would have selected against the recovery of fish, since the majority of fish elements were very small and/or fragmented. However, the extensive wet-sieving of sediments and recovery of minute bones with cheese cloth compensated for the possibility of a recovery bias and found very few fish elements. Therefore, fish were clearly of very minor importance to the people of Ndondondwane.

Furthermore, ethnographic research has revealed that there existed an aversion to fish consumption among Bantu speaking societies. Two viewpoints were listed as to why fish were not considered part of the menu. 1) A fear existed by some that if the fish were removed from the water, the water in the river would dry up and threaten the health of herds, crops and humans. 2) Fish were also regarded as water snakes, and snakes are rejected as food due to a belief that ancestor spirits may reveal themselves in the form of snakes. Only diviners normally use snakes for rituals, potions and adornment. Traditionally, any animals used for witchcraft were left alone by most societies (Beukes 2000: 41-43; Holtz 1996: 91).

b) In terms of the wild taxa, was the occupant's economy driven by a culturally selective strategy?

Continued from research Questions 3a and 3b, a pattern of selective strategy can be determined exhibiting overall choice by hunters that included specific wild species in the zooarchaeological assemblage. The frequencies of wild taxa identified at Ndondondwane will determine if conscious choices may have been made on food selection.

As determined from research Question 1, wild zooarchaeological remains represent a much smaller sample of the assemblage than the domestics. Yet, individual wild mammals that were likely hunted (disregarding intrusive species such as rodents) were found to total 38 different species (Table 23). Therefore, even though the NISPs for the wild fauna were considerably lower than that of domestics, hunting was indeed prevalent during the occupation of Ndondondwane. Furthermore, due to the large diversity of wild species identified in the assemblage, it can be assumed that the hunters likely did not normally predetermine a specific species for meat (other than hippopotamus), but rather killed the game they happened upon or tracked. It is probable that certain species encountered while hunting were spared or avoided due to the potential presence of cultural beliefs or taboos. Ethnographic research may provide some insight into this possibility, but it is not testable by zooarchaeological analysis.

D. Research question 4: Is there a discernable differentiation of dietary patterns between the main chronological horizons at Ndondondwane?

The determination of differing subsistence strategies between each horizon at Ndondondwane was examined through taxonomic inventory and frequencies of the presence/absence of each species for each secured horizon.

In general, the NISPs for each secured horizon are as follows:

1. Lower Horizon – contained an overall NISP of 2,449 that included 1,924 domestic fragments and 475 wild. Furthermore, the Lower Horizon consisted of almost 25% of the entire assemblage.

2. Middle Horizon – with a total NISP of 5,418 that signifies almost 55% of the Ndondondwane assemblage, the Middle Horizon represents the peak of deposition for

zooarchaeological material at the site. The Middle Horizon contained a NISP of 3,915 domestic fragments and 1,503 wild.

3a. Upper Horizon– denotes the abandonment phase of the existence of Ndondondwane. A NISP of 271 was recovered from this level, which represents a dramatic plummet from the Middle Horizon.

3b. Upper Horizon– represents the re-utilization of Ndondondwane and contained a total NISP of 321 that consisted mainly of domestics (NISP 242) over wild (NISP 79).

4. Plough Zone – is the culmination of all horizons displaced by agricultural activities as well as site erosion. The total NISP 1,503 indicates a considerable portion of the assemblage out of true context.

1. Harvest profiles

The harvest profiles for domestic species by horizon demonstrated a decrease of culled pre-adult populations for both cattle and goats from the Lower to the Middle Horizon. Cattle exhibited a 6% decrease and goats 11%. Furthermore, the number of juveniles slaughtered for both cattle and goats decreased by 6-7% from the Lower Horizon to the Middle Horizon. With sheep, the juvenile culling pattern increased while the subadults decreased over the same time span (Tables 75a and 75b). The change in the cattle and goat culling patterns may represent a minor refinement to the harvest profile during the time when the site was reaching its peak occupation period (Figures 17 to 19).

2. Domestic population growth

Also, domestic populations increased by an astronomical rate between the two main temporal periods (Lower and Middle). The total NISP for domestic species during the Lower Horizon amounted to 971 (310 cattle; 78 goats; 147 sheep and 436 sheep/goats). The total NISP increased to 2,136 domestics by the end of the Middle Horizon, with each species more than doubling in number (Tables 75a and 75b). By the onset of both of the sub-phases (Upper 3a and 3b) of the Upper Horizon, the populations of all domestic species plummet to amounts that are nearly non-existent, for example total NISPs of 193 in 3a Upper and 242 in 3b Upper (Table 30b). This was likely associated with the expansion of the site and an increase of the size of the human population. Furthermore, the decrease of zooarchaeological material in the Upper Horizons reflects the lower human population as the site was abandoned.

3. Presence of wild fauna

In general, the bulk NISPs for Ndondondwane by secured horizon demonstrated massive increases from the Lower Horizon (NISP 475) to the Middle Horizon (NISP 1,503), which more than tripled in the amount of zooarchaeological material deposited. The number of wild material virtually dissipates by the Upper Horizon with a total NISP of 157 for both the 3a and 3b Upper levels (Table 39). When examined by class, the Middle Horizon contained the bulk of the material for every wild class present at Ndondondwane. The Lower Horizon had the second highest total for each of the wild classes at the site. Little was recovered from the Upper Horizons (Table 40). Furthermore, the bulk of the wild fauna was recovered from the central zone of Ndondondwane which represented 95% of the wild assemblage (Table 38).

Due to the magnitude of the wild fauna deposited within the centralized zone, it is apparent that the males of Ndondondwane were directly associated with all aspects of the wild fauna, from hunting and butchering to consumption. The wild zooarchaeological remains rarely appear to exit the central areas, therefore remaining within the confines of the centralized male activity areas. Although, this may demonstrate that the wild carcasses were butchered within central areas and the bones were deposited there, it is likely that the meat was distributed for all the occupants to consume.

4. Presence of ivory

A total NISP of 1,569 fragments of ivory identified to species were recovered and identified at Ndondondwane. A further 1960 ivory flakes (no species identification) were recovered from the Mound Area by Maggs (1984a) in 1978 (Voigt and von den Dreisch 1984). The ivory assemblage consisted of a NISP of 1,010 hippopotamus and a NISP of 559 elephant fragments. The bulk of the hippopotamus ivory was recovered from the Mound Area (NISP 995), with 13 fragments from the Dung Area and single fragments in Middens 1 and 3 (Table 58). Elephant ivory was recovered from both the Dung Area (NISP 10) and the Mound Area (NISP 549) (Table 60). Thus, from a total accumulation of ivory amounting to a NISP of 3,529, all but 25 fragments were recovered from the Mound Area and all but two fragments originated from the centralized zone.

The bulk of the ivory assemblage was deposited during the Middle Horizon with a combined NISP of 463 (both hippopotamus and elephant). The Lower Horizon contained 36, while Upper 3b. Horizon (NISP 37) and the Plough Zone (NISP 13) contained the remaining ivory (Tables 59 and 61). The other ivory fragments were recovered from mixed horizons.

The completed product from ivory manufacture consisted mainly of arm band-like items for adornment called bangles. There were 45 completed bangles recovered from Ndondondwane, 44 of which were located within the centralized area of the site (the last bangle was recovered from Midden 1). Unfortunately, only 10 bangles were provenanced to secured horizon, nine of which originated from the Middle Horizon and one from the Lower Horizon. There was no evidence that any bangles were created in the Upper Horizons.

Similar to what was described in the preceding wild fauna section; the ivory appears to remain within the confines of the central areas, thus being directly associated with male activity areas. It is therefore plausible to hypothesize that only the males modified the tusks into tools and adornment, such as bangles, without participation by women. Furthermore, the staggering amount of worked ivory and ivory flakes is indicative of a specialized ivory manufacturing activity. According to Voigt and von den Driesch (1984), ivory is normally only found on EIA sites in the form of fragmented arm bands, with little to no evidence of ivory manufacturing.

Overall, through data analysis it has become evident that the major event changes identified by Greenfield and Miller (2004) at Ndondondwane are reflected through the zooarchaeological material presented in this chapter. Furthermore, the research questions presented in the first chapter of this thesis were re-introduced, addressed and with the zooarchaeological data, interpretations provided in this section.

III. Taphonomy

The following section will provide further description to the results of the data analysis of chapter 6, in context to bone attrition from taphonomic processes found affecting the zooarchaeological assemblage at Ndondondwane.

A. Conditions of preservation

Because the soil conditions throughout Ndondondwane were varied, the cultural deposits from each area were affected by influences in different manners. This subsequently affected the level of bone preservation and size of fragmentation of the zooarchaeological material from each area of the site differently. For example, due to the presence of thick layers of ash from the Dung Area, Mound Area and Midden 1 in conjunction with the depth of the deposits, as well as rate of deposition the level of preservation was considerably higher than the remainder of the site. Areas such as Midden 3 contained shallow deposits and were more exposed to agricultural activities, human and animal traffic as well as soil exposure and erosion.

B. Butchering

Bones that exhibited evidence of butchering amounted to a NISP of 1103 (Tables 81, 82, 82b and 82c). The majority of the butchered remains (NISP 710) were chopped, or (NISP 397) sliced or a combination of the two. Most notable is the high frequency of chopped cattle 1st phalanges (NISP 49). Many of these phalanges were chopped in half lengthwise. Normally this would be considered an unusual butchery practise, it is not consistent with lower limb removal (chop marks would be crosswise), or hide removal, but this was not the case. In fact the purpose may possibly be for marrow extraction. The 1st phalanx of cattle has a larger marrow cavity that would likely produce rich fat marrow for consumption or use. Marrow was most likely extracted from the long bones of cattle as well, but due to high levels of fragmentation with the larger elements, there existed little evidence of marrow extraction.

The large number of elements that exhibit butchering evidence, especially chopping, allows for the comprehension of the effect this taphonomic process has on bones. Butchering can be very destructive to a bone assemblage, and with chopping and breakage patterns common on the pre-depositional assemblage, post depositional taphonomic influences continue to damage and reduce the bones over time.

C. Burning

Interestingly, the bulk of the burned assemblage was recovered from the Dung Area, not the Mound Area that appears to be the common occurrence for most categories of analysis. Over half of the entire burned assemblage was identified in the Dung Area (NISP 1347), which demonstrates that the majority of meat roasting and feasting was conducted at the Dung Area (Tables 83 and 84). More importantly, this allows for the realization that since the central area was considered the male area, it is very likely that the majority of large scale roasting of meat and feasting was accomplished by the men of Ndondondwane. The families likely consumed meat as well, but on a smaller scale and within the peripheral domestic activity areas.

D. Weathering

From the data discussed in chapter 6, the bones that exhibited a higher rate of weathering were found (on average) within the Upper 3 Horizon and Plough Zone across Ndondondwane. Furthermore, the lack of weathering on the assemblage from Upper Horizons 3a and 3b was due to the extremely low number of zooarchaeological material recovered from these horizons, creating a sampling bias. Expectation that weathering would be lessened in the Dung and Mound Areas due to the presence of ash deposits was accurate. Both the Dung and Mound Areas contained an average of 23% of each assemblage as light weathering, which was around 15% better than the remaining areas at Ndondondwane (Tables 85 and 86).

E. Gnawing

A NISP of 966 bone fragments exhibited evidence of carnivore and/or rodent gnawing damage at Ndondondwane. The domestics were the most abundant and amounted to a NISP of 726 (75.2% of the gnawed assemblage) (Table 89).

Congruent with the majority of other analyzed categories at Ndondondwane, the bulk of the gnawed assemblage was located at the central area and demonstrated that the denser horizon for gnawed remains were the Middle Horizon (Table 88). Overall, 78% of the assemblage was rodent gnawed, while 22% demonstrated the presence of carnivore activity (Table 87). The abundant number of gnawed bones within the central areas may represent two factors: 1) the middens of the Dung and Mound area were more exposed allowing easier access to bones by carnivores and rodents, while the domestic activity areas were likely kept clean with little available for scavenging; as well as 2) the central areas represented allowable space for the domestic dog population. The dogs may not have been permitted to roam near the domestic activity areas of the peripheral area, but were allowed to occupy the central zone, where a higher rate of carnivore gnawing has been identified.

F. Fragmentation

In general, it was determined that an overall uniform fragmentation pattern existed between most horizons and areas at Ndondondwane. The Mound Area and Midden 1 contained larger sized bone fragments on average than the remainder of the site. For the Mound Area, this may be due to the quantity of deposition within small areas over a short amount of time. Especially during the Middle Horizon, it is apparent that a large amount of refuse was placed on these areas, in turn rapidly covering the previously deposited refuse (Tables 90 and 91). Thus the rapidly buried refuse (i.e. bone, ceramics) were not exposed to certain taphonomic processes that are common at EIA sites (surface weathering, gnawing) allowing for better preservation over time.

Although deposited in soft layers of dung and ash, heavier animal and human traffic in the Dung Area would further fragment some of the larger elements. Placement of the refuse at the Dung Area outside of the main trampling areas would have played a significant factor in levels of preservation and fragmentation. For Midden 1, the deep grain storage pits that were filled with bone and other household debris during the abandonment phase, would have protected any complete or near complete elements from further fragmentation.

Therefore, measuring the taphonomic influence of fragmentation, assisted in determining that an increased rate of deposition occurred during the Middle Horizon creating a protective barrier over previously discarded zooarchaeological material. This in turn provided a higher level of preservation than the Middens that exhibited slower rates of deposition (i.e. Midden 3). Consequently, the increase in the rate of deposition identified at Ndondondwane during the Middle Horizon likely has direct correlation with an increase in population at the site during this time. Midden 3 contained an unusually high amount of heavy fractured zooarchaeological remains. Over 95% of the Midden 3 assemblage was recovered at less than a quarter of the original element size (Tables 90 and 91). As described above, higher levels of fragmentation at Midden 3 were caused by a slower rate of deposition, leaving the bones exposed to a variety of taphonomic processes (i.e. weathering, impact from foot traffic, carnivore gnawing) that were less of an influence on the bones in the Mound and Dung areas.

Higher levels of fragmentation of larger mammal long bones may be representative of marrow extraction and use. The shafts of desired elements containing rich marrow deposits such as larger mammal long bones are chopped and/or crushed to gain access to the fatty food source. For example, the high NISP of hippopotamus carpals, tarsals and metapodials with few other larger elements present may be in direct correlation to marrow extraction of the long bones causing high fragmentation levels.

G. Modified bone and shell

The modified bone tools consisted of awls, eyed needles, points and link shafts, as well as modified bone and shell for adornment (e.g. beads, perforated canines and incisors, and worked ivory - not including flakes). A total NISP of 369 modified bone elements were identified in the assemblage, 75% of which were recovered from the Mound Area and 24% from the Dung Area (Tables 92, 93 and 94).

Of particular note, over half of the modified bone assemblage consisted of bone points and link shafts (Table 92). The presence of such tools along with ostrich egg shell beads is indicative of an extensive trade network between San hunter-gatherer societies and EIA groups. Numerous sites along the Thukela River were found to contain similar artefacts, i.e. Wosi, Mamba (Voigt and Peters 1994a; 1994b). Conversely, recovery of domesticated species (cattle, sheep and goats) has occurred from hunter-gatherer sites within the region (Mazel 1989; Mitchell 2002). Upon inception of the Late Iron Age, the bone tool component greatly diminished due to more reliance on iron tools (Voigt and Peters 1994a).

IV. Conclusion

It was determined that the inhabitants of Ndondondwane were most reliant on their domestic stock with a domestic to wild ratio of almost 4:1. The wild fauna did represent a large enough portion of the identified assemblage to consider it as an important component of the subsistence strategy. Therefore, since it has been established that domestics outnumbered wild fauna by a ratio of 3.8: 1 and that sheep are the most dominant domestic species present at the site, with cattle consisting of more than half that of small stock (2.5:1), it was determined that the inhabitants of Ndondondwane practised a generalized herding economy.

The interpreted harvest profiles revealed that younger populations of cattle and goats were culled at a much lower rate than those of sheep. This suggests that sheep were primarily used for meat while cattle and goats were used for secondary products, such as milking. Therefore, through the interpretation of harvest profiles of the domestic species, it has been concluded that sheep were exploited for a meat based economy, goats were utilized primarily for milk or other unknown secondary products and cattle were exploited for both milk and meat (primary and secondary products).

Fish consisted of a very small part (0.4%) of the assemblage and cannot be considered as an important, if at all, food source. Ethnographic research revealed that taboos involving fish have existed and do exist today. Therefore, ancient taboos on fish may have been the reason why a subsistence resource of fish was not exploited at Ndondondwane (Beukes 2000: 41-43; Holtz 1996: 91).

Even though the NISPs for the wild fauna are considerably lower than that of the domestics, hunting appeared prevalent during the occupation of Ndondondwane. This suggests that they made a substantial contribution to the subsistence economy. Furthermore, due to the large diversity of wild species identified in the assemblage, the low NISPs per species demonstrated a non-species specific hunting specialization. If the wild assemblage was dominated by a single species of antelope, then it was likely that the species abounded around Ndondondwane or that the people specialized in the hunting of that particular species. Therefore, it can be assumed that the hunters likely did not normally predetermine a specific species for meat (other than hippopotamus), but rather killed the game they happened upon or tracked. It is probable that certain species (i.e. carnivores, primates) encountered while hunting were spared or avoided due to the potential presence of cultural beliefs or taboos.

From the analysis and interpretation section of this thesis, the zooarchaeological data by area and secured horizon from Ndondondwane is apparent that the zooarchaeological evidence corresponds very closely to Greenfield and Miller's (2004) assessment of the stages of occupation, abandonment and re-use of Ndondondwane. Both domestic and wild fauna are identified in the Lower Horizon, but only to encounter a massive increase in overall numbers by the Middle Horizon. The abandonment phase (Upper Horizon 3a.), is marked by dramatic decrease of zooarchaeological remains, with many domestics and very little wild fauna. Mainly domestics are found in this horizon as well. Lastly, the Plough Zone had a large accumulation of zooarchaeological material from across the site, yet the provenance is not viable due to severe impact to the various layers by the mixture.

Lastly, this thesis examined how taphonomic processes affect the interpretation of the zooarchaeological material. Appropriate quantification and categorization of the remains must be employed in order to compensate for the degradation of the bones.

Chapter 8: Conclusions

I. Introduction

The intention of this thesis was to contribute to the understanding of the spread of early food producing societies in southeastern Africa. This was accomplished through an intensive zooarchaeological examination of subsistence strategies of Ndondondwane, an EIA site in the region of the Thukela River Valley, KwaZulu-Natal.

The main goal of this investigation was to determine types and levels of exploitation of domestic and wild species by the occupants of Ndondondwane, and to elucidate whether there was a preference for the consumption of domesticates or wild. Furthermore, harvest profiles were created to address how the domestic stock was exploited and for what products. Little investigation has occurred in southern Africa as to whether EIA peoples exploited their domesticated stock strictly for primary products (meat, hide), or if they were exploited further for secondary products, mainly milk or milk-based goods. This research may reveal the benefits of applying several other analytical techniques that may assist in better comprehension of animal exploitation and culling patterns in EIA archaeology.

The research questions and hypotheses were presented in chapter one, providing the purpose for this immense investigation. Chapters two and three provided detailed information on the culture history of the area and site and ethnographic herding patterns of southern and eastern Africa. Chapter four provided information on the site of Ndondondwane, and all attributes of the site. Chapter five introduced the methods that were to be used on the zooarchaeological assemblage and types of analysis that were applicable over that of others. Chapter six launched the data-set and demonstrated analytical procedures in order to generate detailed information from the massive resource. Chapter seven provided interpretations of the analyzed data and discussed the significance of the information gained. The results of the preceding analyses lead to this chapter, -the conclusions and discussion.

In this final chapter, I will offer some conclusions from the work accomplished on the zooarchaeological material at Ndondondwane. Furthermore, brief comparisons to other EIA zooarchaeological sites within the immediate vicinity will allow for the understanding on how distinctive (or typical) Ndondondwane is when examined in conjunction with other similar sites.

II. Results of zooarchaeological analysis

A. Quantification as well as temporal and spatial distribution

The zooarchaeological assemblage from Ndondondwane amounted to a NISP of 47,048 bones, shells and fragments, from which 18,487 (39.3% of the assemblage) was identifiable to a minimum of element type. When examined by spatial distribution, it is apparent that the central area (that consisted of the Dung and Mound Areas, as well as Transects 1 and 2) contained the bulk of the assemblage (83%). Relatively little was found in the three Middens distributed around the periphery of the site (17%).

Examination for similarities of frequencies of deposition of elements between the two main areas of bone deposition in the central zone (the Mound and Dung Areas) revealed very little variation between the two activity zones (Figure 20). The only deviation in terms of element distribution was a large increase of loose teeth and phalanges in the Mound Area over that of the Dung Area. Although cultural activity may have been the reason behind the depositional differences, a sampling bias during earlier excavations represents another alternative. When the relationship between the two areas is tested statically (i.e. Pearson's R), the results were highly correlated (r=.98). This demonstrates that there was almost no variation between the two areas.

When examined by a series of depositional layers (named secured horizons), the Middle Horizon represented the temporal period with the most activity and the largest accumulation of deposition (with more than 50% of entire assemblage) during the life span of the site. The oldest horizon, the Lower Horizon also contained a large quantity of zooarchaeological material, just less than the Middle. The Upper 3a and 3b Horizons demonstrated a drastic drop in gross totals from that of the Middle Horizon. The top horizon, the Plough Zone, consists of a mixture of all other horizons displaced by erosion and/or agricultural activities, such as ploughing.

B. Wild species representation

A large number of wild species were identified but in general, few elements were represented at Ndondondwane. Therefore, the inhabitants of Ndondondwane experienced taxonomic diversity with the wild fauna. Notable species identified at the site included hippopotamus, elephant, giraffe, Cape buffalo, together with numerous antelope species including common duiker, Mountain reedbuck, and eland. Although the majority of hippopotamus and elephant elements consist of tusk fragments from ivory manufacture, over 300 fragments of hippopotamus were bones. This indicates that the animal was not hunted solely for the ivory but was also utilized for meat consumption.

The wild fauna tends to be clustered within the central areas, especially the Mound Area and Dung Area. The majority of the wild stock was recovered in the Lower and Middle Horizons. Very little was found in the Upper or plough zone horizons. Many wild species, such as jackal, hyaena, monkeys, crocodiles, were identified in the assemblage. However, many are not considered as true food resources. Ethnographic research has indicated that these species are directly associated with diviners, healers or medicine people, and can be taboo in some cultures (Beukes 2000; Plug and Voigt 1985).

Very few wild birds, fish, reptiles and amphibians were found at the site. The presence of mollusc species at Ndondondwane is indicative of either/both purposeful collection and possible intrusion. The purpose may be two-fold, 1) for subsistence – molluscs may provide protein and sustenance for the people of Ndondondwane and/or 2) the shells were collected for modification into beads, tools and adornment.

C. Domestic species representation

The domestics identified at Ndondondwane included cattle, goat, sheep, sheep/goat, dog and chicken. A large emphasis was placed on the domestics stock for subsistence, where they outnumber the wild species by a ratio of 4:1. The caprines outnumbered the cattle with a ratio of 2.5:1. Individually, sheep and cattle are more plentiful than goats, and the dog and chicken are present at the site, yet not in great numbers.

Upon examination of harvest profiles for each of the three major domestic species, the true subsistence strategy is revealed for Ndondondwane. Cattle are culled at a small and steady rate until reaching adulthood. Sheep are culled at an early age, where large percentages of the population are culled prior to adulthood. Goats appear as an anomaly where very few are culled throughout the pre-adulthood stages and the culling begins as an adult. The interpretation of the results is as follows: with sheep they are the high rate of slaughter at an earlier age which is indicative of a meat-based economy, where the younger, tender sheep are culled and consumed at a more constant rate. Goats represent the opposite of the sheep economy; very few are culled until into adulthood. This pattern likely represents a focus on a milking economy, where the goats live into adulthood until the milk production ends. With cattle, some were culled at younger ages, but almost half the population are kept alive into adulthood. This is indicative of a mixed economy, where milking is likely the focus for cattle, but meat is being consumed at a higher rate than goat. The purpose of this profile may have been ritual slaughter and feasting during ceremonies on the cattle herds within a community.

III. Archaeological Record Comparison

The following section will briefly examine the zooarchaeological analyses of EIA sites from KZN that (at first glance) appear quite similar to that of Ndondondwane. The purpose of this examination is to determine whether Ndondondwane is a typical EIA site in the Thukela Valley or is it more distinctive. A brief summary of some of the more crucial aspects of site differentiation are provided in Table 95.

A. KwaGandaganda

1. Location and time period

KwaGandaganda was an EIA site in the Mngeni Valley near Durban. Unlike Ndondondwane, KwaGandaganda was occupied continuously between the AD 7th and 11th centuries. This site was occupied throughout the Msuluzi, Ndondondwane and Ntshekane phases (Whitelaw 1994).

2. Recovery and species representation

The total NISP for KwaGandaganda from all temporal phases was 41,006 fragments, with only 9,374 (22.9%) fragments listed as identifiable. The Ndondondwane phase consisted of 22,647 fragments with 5230 fragments identifiable. According to Beukes (2000), 68 species were identified from the assemblage, where mammal remains consisted of the bulk of the assemblage. A high percentage of cattle phalanges with pathologies were identified as possible traction animals (Beukes 2000).

3. Harvest profiles

Harvest profiles were not conducted in detail, so comparing economic strategies is difficult. The information provided identified that younger adults (Age Class V) were the dominant age group in the Ndondondwane temporal phase of KwaGandaganda. This age group is on the cusp for product exploitation determinism.

4. Ivory and bone tools

Beukes (2000) does not provide totals of modified bone from KwaGandaganda. From extrapolation of the information provided, 72 bone points and link shafts were recovered as well as numerous modified bones, teeth and shell. For ivory fragments, no total count of fragments were accomplished, but a total weight of 4262.5 grams was recorded (Beukes 2000: 310). A minimum of two ivory bangles were also recovered.

5. Summary

KwaGandaganda demonstrates similarities to Ndondondwane in context to size of assemblage, species list and even presence of carved ivory and bone tools, as well as ceramic figurines. The difference arises when one realizes that the accumulation of zooarchaeological material at KwaGandaganda occurred over almost 400 years of occupation during the EIA, spanning three sub-phases. While the total amount of zooarchaeological material from Ndondondwane amounts to a larger sample in almost all capacities and categories was amassed in less than a 50 year span.

Therefore, KwaGandaganda in a general sense is relatively similar to Ndondondwane by rough counts and species distribution until the temporal factor is added. The size of the excavation is similar in that both sites were extensively excavated. Therefore, the differences are not due to differences in the scale of investigation. But, time span that the two sites were occupied does appear to play a difference in the amount of material accumulated; Ndondondwane appears to have accumulated a much larger amount of zooarchaeological material in a shorter period of time, and especially status associated material (ivory, ceramic mask and figurines, bone tools).

B. Wosi

The zooarchaeological data for Wosi consists of a preliminary report (Voigt and Peters 1994a) attached to the site excavation report (van Schalkwyk 1994a). The data described in this section are likely not complete, but no other research has been accomplished on the zooarchaeological material at this site.

1. Location and time period

The Wosi Site is an EIA site (from the 7th to 8th century AD), located approximately 1500 m down the Thukela River from Ndondondwane. The site covers approximately 10 ha of area and is situated within a similar environment as Ndondondwane. Wosi consisted of a site with 22 identified middens scattered throughout the area (van Schalkwyk 1994a).

2. Recovery and species representation

A total of 6,855 fragments were provided as the identifiable assemblage, representing 56 species. Caprines consisted of the bulk of both the domestic assemblage as well as the entire zooarchaeological assemblage. The small stock to cattle ratio was approximately 25:1. Domestics dominated overall with a NISP of 5,624 (Voigt and Peters 1994a).

3. Harvest profiles

From the rough harvest profile, cattle appear to be culled consistently throughout the younger ages. Only a small percentage survives into adulthood. The culling patterns of cattle for Wosi represent a meat-focused economy. For the caprines, the harvest profile demonstrated a slaughter pattern that gradually increased as the animals aged. By adulthood, 64% of the population had been culled. The profile may be a mixed product focus (meat and milk), or it is meat based with a small breeding population kept alive a little longer than usual.

4. Ivory and bone tools

Only a few hippopotamus fragments were identified (NISP 26), with elephant as the dominant wild species with a NISP of 291. Apart from the few ivory fragments, 48 fragments of ivory bangles were also noted from Wosi. A total of 34 modified bone tools were recovered, including 24 points and link shafts (Voigt and Peters 1994a).

5. Summary

Overall, little is comparable between Wosi and Ndondondwane. The use of cattle appears to be in an incipient stage with very little elements present. Caprines more than dominated the assemblage with a rough harvest profile of a meat-based economy. One interesting point is that a rare dwarf goat breed was identified in both the Wosi and Ndondondwane assemblages. The anomaly from Wosi is the high number of bangle fragments when compared to a low amount of ivory fragments present at the site.

C. Mamba

Similar to Wosi, the Mamba data only consists of a preliminary faunal report (Voigt and Peters 1994b) attached to the site excavation report (van Schalkwyk 1994b). The data presented here are incomplete since only a preliminary report has been completed.

1. Location and time period

Mamba is the third site excavated in the lower Thukela River valley (Ndondondwane and Wosi) and contains the typical attributes for an EIA site on the Thukela River (see above). It is located on the north shore of the Mamba River at the confluence with the Thukela River. Mamba contained a large amount of smelting debris indicating long term use as a smelting site (van Schalkwyk 1994b).

2. Recovery and species representation

Very little identifiable bone was recovered from the site (NISP 1,137), but the overwhelming majority was domesticates with a NISP of 980. Cattle dominated the assemblage with a NISP of 646, while caprines (combined sheep/goat) had a NISP of 302. Therefore, the cattle to small stock ratio for the Mamba site were more than 2:1 (Voigt and Peters 1994b).

3. Harvest profiles

The harvest profiles for both cattle and caprines exhibit a uniform culling pattern from infant to adulthood ages. The only difference was the adult cattle were considerably less than the average amount. The caprines are clearly indicative of a meat-based economy for small stock, but cattle may show some evidence of secondary products exploitation (Voigt and Peters 1994b).

4. Ivory and bone tools

Only two bone tools were identified at Mamba, along with 11 ivory fragments from both hippopotamus and elephant. No ivory bangle fragments were recovered.

5. Summary

Therefore, due to the extremely large number of cattle over caprines and the harvest profiles indicating a strictly meat-based economy. Together with the lack of ivory manufacturing, these data demonstrate a large difference in site use patterning and site hierarchy when compared to Ndondondwane.

D. Comparison of results to independent research by Liz Arnold (2006)

This section will briefly examine the data gathered by an independent research project on harvest profiles for the domestic stock at Ndondondwane by Liz Arnold. Arnold used a sample of 28 cattle individual mandibles to create harvest profiles for the domestic stock. The harvest profiles were based on the tooth wear and eruption sequences. She argues that tooth wear and eruption sequences are more sensitive and can create many more age classes than traditional ageing techniques. It also avoids many of the problem inherent in taphonomic biases since mandibles and teeth are the most resistant to attrition. In contrast, this thesis used all of the ageable data from the assemblage. It includes both the epiphysial fusion and tooth eruption and tooth wear data. Also, Arnold grouped all sheep and goat specimens into a single sheep/goat category. In contrast, the data from each taxon are separately analyzed here. Both analyses are useful and they are compared next.

Arnold's results indicate a uniform pattern of culling over the various age ranges, with few individuals present in the youngest and oldest age categories. My results indicated a similar pattern to that of Arnold, but with a small increase in culling during the adult stage. Otherwise, the two analytical techniques proved analogous.

The differences become more notable when considered by taxon. There is an apparent with the age profiles of the caprines. In Arnold's grouped analysis of all caprines, she concluded that the population was being slaughtered at a young age, indicating a meat-based economy. The sheep and sheep/goat harvest profiles calculated for this thesis are broadly congruent with those of Arnold. However, the goat harvest profile differed substantially. The culling pattern for goats indicated that the majority of the goats survived into adulthood. This was indicative of secondary product exploitation for the goat herds of Ndondondwane. When the caprines were grouped together, the species with a lesser NISP (i.e. goat) becomes inundated by the more numerous caprine species of sheep and sheep/goat. Therefore the results of a secondary product exploitation economy of goats were lost within the lumped harvest profile.

E. Conclusion of comparisons with other sites

In summary, examination of comparable data of the three EIA sites presented in the above section determined that Ndondondwane is most similar to KwaGandaganda on a broad spectrum. Temporally, KwaGandaganda consisted of a minimum of four cultural horizons that span four centuries. The total zooarchaeological assemblage for KwaGandaganda was less than the total for Ndondondwane, yet the occupation was far longer (400 versus 40-50 years). The question arises if the zooarchaeological assemblage at Ndondondwane is greater than the long-term assemblage from KwaGandaganda, were there activities at Ndondondwane (feasting or meat processing) that created a larger accumulation of zooarchaeological material over a much shorter time period, or was there a sampling bias due to the nature of the different excavation methods? Similar to Ndondondwane, KwaGandaganda contained worked ivory, including a bangle, and modified bone and teeth for tools and adornment.

Wosi demonstrated some similar site characteristics to Ndondondwane, including a larger species list that exhibited a larger diversity. Wosi also contained more ivory bangle and fragments (NISP 427) and bone tools (NISP 32).

Mamba showed evidence for possible secondary product exploitation for cattle from the harvest profiles. Otherwise, there were few similarities between the two sites.

IV. Significance of Ndondondwane

The significance of Ndondondwane becomes more apparent after attempting to compare similar variables with the three EIA sites described above. Overall, none of the sites matched with Ndondondwane, even though most of the sites were geographically and temporally similar.

A. Ivory

Evidence for the distinctive nature of Ndondondwane is the unusually large amount of zooarchaeological material recovered, especially when compared to

KwaGandaganda. In particular, there was an unusually large amount of ivory fragments from Ndondondwane. Voigt and von den Driesch (1984) identified 1,960 fragments of ivory; while a further 1,569 fragments were identified in the later analyses. In addition to the ivory fragments, 44 ivory armband fragments (bangles) were recovered. The magnitude of the amount of ivory present at a single site occupied during a brief span of time signifies that the site was the location of a specialized manufacturing area. A large number of bone tools including link shafts, points and various forms of adornment as well as shell beads and adornment were also recovered from the site, possibly demonstrating a separate specialized workshop.

B. Harvest profiles

Apart from the zooarchaeological assemblage, the significance of Ndondondwane is expressed by the harvest profiles. They demonstrate that the economy of the site was characterized by a diversified subsistence strategy with the domestic species. Sheep were mostly bred for meat, while cattle were heavily utilized for milk, and secondarily exploited for meat during ritual ceremonies. Furthermore, goats were maintained into adulthood with a focus on milk production.

C. Ritual and ceremonial

Delving outside of the zooarchaeological circle, the Ndondondwane excavations revealed a unique constellation of artifactual remains that is not common. For example, the crocodile mask fragments that are comparable to the famous Lydenburg ceramic heads of southern Africa. Although mysterious, the ceramic mask fragments are safely assumed to be deeply immersed in ritual and ceremonial activities. In conjunction with the mask fragments were fired stylized ceramic figurines that were assumed to be part of a coming of age ritual (Loubser 1993).

When compared to similar EIA sites along the Thukela and surrounding areas, Ndondondwane does appear to hold a level of distinctiveness within that portion of KZN. Discussions with colleagues (Greenfield, van Schalkwyk, Whitelaw) over the past few years have constantly arrived back to the wealth of artifactual remains, ceramics, grind stones, hut floors, furnaces and one of the largest zooarchaeological assemblages from the region plus, ritual and ceremonial associations with rare mask fragments and stylized ceramic figurines. Additionally, the quality of the artifacts present, the overall size and density of the artefacts throughout the site, and the unique areas of specialized activities assist in proposing that the site of Ndondondwane was not just a common homestead, but the homestead of a person in power, such as a Chief.

D. Public recognition of the importance of Ndondondwane

The value and distinctiveness of Ndondondwane was proven further when Gavin Whitelaw of the Natal Museum, submitted a report in 1995 named *Statutory recognition of archaeological sites located in the former KwaZulu: a survey of archaeological site records in the Natal Museum* to the KwaZulu-Natal Monuments Council in Ulundi. This report requested that Ndondondwane receive "statutory recognition as a provincial monument (Provincial Heritage Sites) and be jointly conserved within an historical preservation area or cultural conservancy" (Greenfield et al. 1997: 51). Whitelaw also suggested that Ndondondwane should become the site for a new EIA museum and/or interpretive centre.

V. Conclusions

In conclusion, the in-depth zooarchaeological analysis of the zooarchaeological assemblage from Ndondondwane demonstrates that the domesticated herds of cattle, sheep and goats were the dominant form of subsistence strategies. Moreover, the wild portion of the assemblage represents a supplemental role towards the diet of the inhabitants of Ndondondwane.

The application of harvest profiles dispelled an expectation that EIA sites, such as Ndondondwane, tended cattle herds with the focus on increasing the herd size for wealth and status. Rather, the harvest profiles revealed that cattle were exploited for both primary (meat) and secondary (milk) products, with no evidence towards exponential herd growth.

Furthermore, evidence that the cattle were being exploited for meat, but at an older age than expected, introduces an important concept of use of cattle for ceremonial feasting. Normally by choice, older animals are not primary choices for consumption; rather the younger and tenderer animals are the optimal selection for food. Therefore, the slaughter of older cattle for meat is likely immersed in ritual meaning or set for ceremonial feasting purposes.

From the intensive literature review and research conducted for this paper, very little information was found on a similar research focus in southern Africa. Scholars such as Marshall (1990) and Gifford-Gonzalez (1984; 2000) have examined past cultures in eastern Africa with similar topics in mind. This thesis makes a very different kind of contribution in that it utilizes a multi-faceted approach to determine subsistence strategies of an ancient EIA culture at Ndondondwane. This thesis demonstrates the value of detailed and varied zooarchaeological analyses in order to provide comprehensive data on EIA faunal assemblages in southeastern Africa.

Thesis Bibliography

Albarella, Umberto 2002 'Size matters': how and why biometry is still important in zooarchaeology. In Keith Dobney and Terry O'Connor (eds.), *Bones and the Man: Studies in Honour of Don Brothwell*, Oxbow Books, Oxford, pp. 51-62.

Avery, D. M. 1984 Sampling procedures and cautionary tales, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 375-379.

Avery, Graham 1984 Agencies and numbers: the faunal workshop, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 329-333.

Badenhorst, Shaw 2002 The ethnography, archaeology, rock art and history of goats (*Capra hircus*) in southern Africa: an overview, *Anthropology Southern Africa*, 25 (3 & 4): 96-103.

Barich, B.E. 2002 Cultural responses to climatic changes in North Africa: beginning and spread of pastoralism in the Sahara. In Fekri Hassan (ed.), *Droughts, Food and Culture: ecological change and food security in Africa's later prehistory*, Kluwer Academic/Plenum Publishers, New York, pp. 209-223.

Beukes, Catharina 2000 KwaGandaganda: an archaeozoological case study of the exploitation of animal resources during the Early Iron Age in KwaZulu-Natal. Unpublished MA dissertation, University of South Africa.

Blench, Roger 1985 *Pastoral Labour and Stock Alienation in the Sub-Humid and Arid Zones* of West Africa. Paper 19e Overseas Development Institute (ODI), Agricultural Administration Unit, Pastoral Development Network. The Chameleon Press LTD, London.

Blumenschine, R.J. & Caro, T.M. 1986 Unit flesh weights of some east African bovids, *African Journal of Ecology*, 24: 273-286.

Bonte, Pierre 1991"To increase cows, God created the king": the function of cattle in intralacustrine societies. In John Galany and Pierre Bonte (eds.), *Herders, Warriors and Traders: pastoralism in Africa*. African Modernization and Development Series, Westview Press Inc., Colorado, pp. 62-86.

Bonte, Pierre and Galaty, John 1991 Introduction. In John Galany and Pierre Bonte (eds.), *Herders, Warriors and Traders: pastoralism in Africa*. African Modernization and Development Series, Westview Press Inc., Colorado, pp. 3-31.

Bousman, C. Britt 1998 The chronological evidence for the introduction of domestic stock into southern Africa, *African Archaeological Review*, 15 (2): 133-149.

Brewer, Douglas J. 1992 Zooarchaeology: method, theory, and goals, In M.B. Schiffer (ed.) *Archaeological Method and Theory, Vol. 4*, The University of Arizona Press, Tuscon, pp. 195-244.

Cable, Charles 1984a *Economy and Technology in the Late Stone Age of Southern Natal*, Cambridge Monographs in African Archaeology 9, BAR International Series 201.

Cable, Charles 1984b A model for terminal Later Stone Age subsistence strategies in southern Natal, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 167-181.

Clutton-Brock, Juliet 1993 The spread of domestic animals in Africa. In *The Archaeology of Africa: food, metals and towns*. T. Shaw, P. Sinclair, B. Andah, and A. Okpoko (eds.). London, Routledge, pp. 61-79.

Clutton-Brock, Juliet 1995 The legacy of Iron Age dogs and livestock in southern Africa, In J.E.G. Sutton (ed.), *The Growth of Farming Communities in Africa from the Equator Southwards, Azania* 29-30: 161-167.

Clutton-Brock, Juliet 2000 Cattle, sheep, and goats south of the Sahara: an archaeozoological perspective. In Roger Blench and Kevin MacDonald (eds.). *The Origins and Development of African Livestock: archaeology, genetics, linguistics and ethnography*, UCL Press, New York, pp. 30-37.

Collier, Stephen & White, J. Peter 1976 Get them young? age and sex inferences on animal domestication in archaeology, *American Antiquity*, 41(1): 96-102.

Cruz-Uribe, Kathryn 1988 The use and meaning of species diversity and richness in archaeological faunas, *Journal of Archaeological Science*, 15: 179-196.

Dahl, G. and Hjort, A. 1976 *Having herds: pastoral herd growth and household economy*. Stockholm Studies in Social Anthropology 2. Department of Social Anthropology, University of Stockholm. Liber Tryck: Stockholm.

Daly, Patricia 1969 Approaches to faunal analysis in archaeology, *American Antiquity* 34 (2): 146-153.

Davis, Simon 1984 The advent of milk and wool production in western Iran: some speculations. In Juliet Clutton-Brock and Caroline Grigson (eds.), *Animals and Archaeology: 3. Early Herders and their Flocks*. BAR International Series 202, pp. 265-278.

Davis, Simon 1987 *The Archaeology of Animals*, Yale University Press, New Haven.

Davis, Simon 1993 The zooarchaeology of sheep and goats in Mesopotamia, In N. Postgate (ed.), *Domestic animals of Mesopotamia, part 1, The Bulletin on Sumerian Agriculture*, 7: 1-7.

Davison, Jean 1997 *Gender, Lineage, and Ethnicity in Southern Africa*. Westview Press, Boulder, Colorado.

Denbow, J.R. 1984 Cows and kings: a spatial and economic analysis of a hierarchical Early Iron Age settlement system in eastern Botswana. In M. Hall, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*, Oxford, British Archaeological Reports, pp. 24-39.

Evers, T.M. 1984 Sotho-Tswana and Moloko settlement patterns and the Bantu cattle pattern, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 236-247.

Fowler, Kent, Greenfield, Haskel and van Schalkwyk, Len 2000 The identification and significance of ceramic ecofacts from Early Iron Age Ndondondwane, South Africa, *Southern African Field Archaeology*, 9: 32-42.

Fowler, Kent, Greenfield, Haskel & van Schalkwyk, Len 2004 The effects of burrowing activity on archaeological sites: Ndondondwane, South Africa, *Geoarchaeology: An International Journal*, 19 (5): 441-470.

Fratkin, Elliot 1998 Ariaal Pastoralists of Kenya: surviving drought and development in Africa's arid lands, Allyn and Bacon, Boston.

Fread, Edward R. 1997 Ndondondwane field notes, (unpublished).

Fread, Edward R. 1998 Ndondondwane field notes, (unpublished).

Fread, Edward R. 1999 Culturally modified bone from Ndondondwane, South Africa: a preliminary report, *9th Annual APALA Conference Proceedings*, pp. 139-147.

Gidney, Louisa 2000 Economic trends, craft specialisation and social status: bone assemblages from Leicester, In Peter Rowley-Conwy (ed.), *Animal Bones, Human Societies*, Oxbow Books, Oxford and Oakville; pp. 170-178.

Gifford-Gonzalez, D.P. 1984 Implications of a faunal assemblage from a pastoral Neolithic site in Kenya: findings and a perspective on research. In J. Desmond Clark and Steven A. Brandt (eds.), *From Hunters to Farmers: the causes and consequences of food production in Africa*. University of California Press, Berkeley, pp. 240-251.

Gifford-Gonzalez, D.P. 2000 Animal disease challenges to the emergence of pastoralism in Sub-Saharan Africa, *African Archaeological Review*, 17(3): 95-139.

Gilbert, Allan S. & Singer, Burton H. 1982 Reassessing zooarchaeological quantification, *World Archaeology: Quantitative Methods* 14(1): 21-40.

Greenfield, Haskel 1988 The origins of milk and wool production in the Old World: a zooarchaeological perspective from the Central Balkans, *Current Anthropology* 29(4): 573-593.

Greenfield, Haskel 1989 From pork to mutton: a zooarchaeological perspective on colonial New Amsterdam and early New York, *Northeast Historical Archaeology* 18: 85-110.

Greenfield, Haskel 1998 Aspects of recent research at Ndondondwane: a response to Loubser, *Southern African Field Archaeology* 7: 114-116.

Greenfield, Haskel 2005a A reconsideration of the secondary products revolution in south-eastern Europe: on the origins and use of domestic animals for milk, wool, and traction in the central Balkans. In J. Mulville & A.K. Outram (eds.). *The Zooarchaeology of Fats, Oils, Milk and Dairying.* 9th ICAZ Conference, Durham, 2002, pp. 14-31.

Greenfield, Haskel 2005b The zooarchaeological remains from Early Iron Age hill-top fortress at Klisura-Kadića Brdo, eastern Bosnia: a taphonomic assessment. *Godišnjak Jahrbuch*, Akademija Nauka I Umjetnosti Bosne I Hercegovine, 32: 107-150.

Greenfield, Haskel, van Schalkwyk, Len & Jongsma, Tina 1997 Preliminary results of the 1995 research at the Early Iron Age site of Ndondondwane, KwaZulu-Natal, South Africa, *Nyame Akuma*, 47: 42-52.

Greenfield, Haskel, van Schalkwyk, Len & Jongsma, Tina 2000 Surface and subsurface reconnaissance at Ndondondwane: preliminary results of the 1995-1997 field seasons, *Southern African Field Archaeology*, 9: 5-16.

Greenfield, Haskel, & van Schalkwyk, Len 2003 Intra-settlement social and economic organization of Early Iron Age farming communities in Southern Africa: a view from Ndondondwane, *Azania,* XXXVIII: 121-137.

Greenfield, Haskel & Miller, Duncan 2004 Spatial patterning of Early Iron Age metal production at Ndondondwane, South Africa: the question of cultural continuity between the Early and Late Iron Ages, *Journal of Archaeological Science* 31: 1511-1532.

Greenfield, Haskel, Fowler, Kent & van Schalkwyk, Len 2005 Where are the gardens? Early Iron Age horticulture in the Thukela River basin of South Africa, *World Archaeology*, 37(2): 305-326.

Grier, Colin & Savelle, James M. 1994 Intrasite Spatial patterning and Thule Eskimo social organization, *Arctic Anthropology*, 31(2): 95-107.

Hall, Martin 1981 *Settlement Patterns in the Iron Age of Zululand: an ecological interpretation*, Cambridge Monographs in African Archaeology 5, BAR International Series 119.

Hall, Martin 1984a Prehistoric farming in the Mfolozi and Hluhluwe Valleys of South-East Africa: an archaeo-botanical survey, *Journal of Archaeological Science*, 11: 223-235.

Hall, Martin 1984b The myth of the Zulu homestead: archaeology and ethnography, *Africa: Journal of the International African Institute*, 54(1): 65-79.

Hall, Martin 1986 The role of cattle in southern African agropastoral societies: more than bones alone can tell, In Martin Hall and Andrew B. Smith (eds.), *Prehistoric Pastoralism in Southern Africa*, The South African Archaeological Society, Goodwin Series 5, pp. 83-87.

Hall, Martin 1987 Archaeology and modes of production in pre-colonial southern Africa. *Journal of Southern African Studies* 14(1): 1-17.

Hall, S. L. 1984 Questions concerning faunal sampling, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), In *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 373-374.

Hamm, Jim 1989 *Bows and arrows of the Native Americans*, The Lyons Press, Connecticut, USA.

Hesse, Brian 1982 Slaughter patterns and domestication: the beginnings of pastoralism in Western Iran, *Man*, 17: 403-417.

Hesse, Brian & Wapnish, Paula 1985 *Animal Bone Archaeology: From Objectives to Analysis*, Manuals on Archaeology 5, Taraxacum Inc., Washington.

Hogg, Richard 1985 *Re-Stocking Pastoralists in Kenya: a strategy for relief and rehabilitation.* Paper 19c Overseas Development Institute (ODI), Agricultural Administration Unit, Pastoral Development Network. The Chameleon Press LTD, London.

Holl, Augustin F.C. 1998 The dawn of African pastoralisms: an introductory note, *Journal of Anthropological Archaeology*, 17: 81-96.

Huffman, Thomas N. 1982 Archaeology and ethnohistory of the African Iron Age, In Siegel, Benard J., Beals, Alan R., and Tyler, Stephen A.(eds.), *Annual Review of Anthropology* Vol. 11, Annual Reviews Inc., Palo Alto, California, pp. 133-150.

Huffman, Thomas N. 1984 Leopard's kopje and the nature of the Iron Age in Bantu Africa, *Zimbabwea*, 1: 28-35.

Huffman, Thomas N. 1986a Iron Age settlement patterns and the origins of class distinction in southern Africa, In: Wendorf, F. and Close, E. (eds.), *Advances in World Archaeology vol. 5*, Academic Press, New York, pp. 291-338.

Huffman, Thomas N. 1986b Archaeological evidence and conventional explanations of southern Bantu settlement patterns, *Africa* 56 (3): 280-298.

Huffman, Thomas N. 1986c Cognitive studies of the Iron Age in southern Africa, *World Archaeology* 18 (1): 84-95.

Huffman, Thomas N. 1996a *Snakes & Crocodiles: Power and Symbolism in Ancient Zimbabwe*, Witswatersrand University Press, Johannesburg.

Huffman, Thomas N. 1996b Archaeological evidence for climatic change during the last 2000 years in southern Africa, *Quarternary International*, 33: 55-60.

Huffman, Thomas N. & Herbert, R.K. 1995 New perspectives on eastern Bantu, *Azania* 29-30: 1-10.

Jackson, H. Edwin 1989 The trouble with transformations: effects of sample size and sample composition on meat weight estimates based on skeletal mass allometry, *Journal of Archaeological Science* 16: 601-610.

Jones, Peta 1984 Mobility and migration in traditional African farming and Iron Age models, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, 289-298.

Karr, Landon; Hannus, Adrien & Outram, Alan 2005 Bone grease and bone marrow exploitation on the plains of South Dakota: a new perspective on bone fracture evidence from the Mitchell Prehistoric Indian village. A Bush Foundation Research Project, Augustana College, Rock Island, Illinois.

Katanekwa, N.M. 1979 Namakala and Nanga sites and the chronology of the Early Iron Age in southern and south-west Zambia, *The South African Archaeological Bulletin* 34(130): 120-122.

Kent, Susan 1993 Variability in faunal assemblages: the influence of hunting skill, sharing, dogs, and mode of cooking on faunal remains at a sedentary Kalahari community, *Journal of Anthropological Archaeology* 12: 323-385.

Kintigh, Keith W. 1989 Sample size, significance, and measures of diversity. In R.D. Leonard and G.T. Jones (eds.), *Quantifying Diversity in Archaeology*. New Directions in Archaeology, Cambridge University Press, Cambridge, pp. 25-36.

Klein, Richard G. 1984a *The Analysis of Animal Bones from Archaeological Sites*, The University of Chicago Press, Chicago.

Klein, Richard G. 1984b The large mammals of southern Africa: Late Pliocene to recent. In Richard G. Klein (ed.), *Southern African Prehistory and Paleoenvironments*, A.A.Balkema, Rotterdam.

Klein, Richard G. 1989 Why does skeletal part representation differ between smaller and larger bovids at Klasies River Mouth and other Archaeological sites, *Journal of Archaeological Science* 6: 363-381.

Klein, Richard G. & Cruz-Uribe, Kathryn 1987 Large mammal and tortoise bones from Eland's Bay Cave and nearby sites, Western Cape Province, South Africa, In John Parkington & Martin Hall (eds.), *British Archaeological Reports International Series*, vol. 332: 132-163.

Klein, Richard G. & Cruz-Uribe, Kathryn 1989 Faunal evidence for Prehistoric Herder-Forager activities at Kasteelberg, Western Cape Province, South Africa, *South African Archaeological Bulletin* 44: 82-97.

Klein, Richard G., Cruz-Uribe, Kathryn & Beaumont, Peter B. 1991 Environmental, ecological, and paleoanthropological implications of the Late Pleistocene Mammalian fauna from Equus Cave, Northern Cape Province, South Africa, *Quaternary Research* 36: 94-119.

Kuper, Adam 1987 *South Africa and the Anthropologist*, Routledge & Kegan Paul, New York.

Lane, Paul 1995 The use and abuse of ethnography in Iron Age studies of southern Africa, In J.E.G. Sutton (ed.), *The Growth of Farming Communities in Africa from the Equator Southwards, Azania* 29-30: 51-64.

Lane, Paul 1998 Engendered spaces and bodily practices in the Iron Age of southern Africa, In *Gender in African Prehistory*, Susan Kent (ed.), AltaMira Press, Walnut Creek, U.S.A., pp. 179-204.

Lauwerier, Roel C.G.M. 1988 *Animals in Roman times in the Dutch Eastern River area*, Nederlandse Oudheden 12, Project Oostelijk Rivierengebied I, Amersfoort.

Legge, Tony 2005 Milk use in Prehistory: the osteological evidence, In J. Mulville & A.K. Outram (eds.). *The Zooarchaeology of Fats, Oils, Milk and Dairying*. 9th ICAZ Conference, Durham, 2002, pp. 8-13.

Loubser, Jannie H. N. 1993 Ndondondwane: the significance of features and finds from a ninth-century site on the lower Thukela River, Natal, *Natal Museum Journal of Humanities* 5: 109-151.

Loubser, Jannie H. N. 1998 Ndondondwane and the archaeology of deeply buried deposits conducted under unusual conditions: a response to van Schalkwyk et al., *Southern African Field Archaeology* 7: 111-114.

Lyman, Lee R. 1992 Anatomical considerations of utility curves in zooarchaeology, *Journal of Archaeological Science* 19: 7-22.

Lyman, Lee R. 1994 *Vertebrate Taphonomy*, Cambridge Manuals in Archaeology, Cambridge University Press, Cambridge.

Mack, Kathleen, Maggs, Tim, and Oswald, Dana 1991 Homesteads in two rural Zulu communities: an ethnoarchaeological investigation, *Natal Museum Journal of Humanities* 3: 79-129.

Maggs, Tim 1976 *Iron Age Communities of the Southern Highveld*, Occasional Publications of the Natal Museum No. 2, The council of the Natal Museum, Pietermaritzburg.

Maggs, Tim 1984a Ndondondwane: a preliminary report on an Early Iron Age site on the lower Tugela River, *Annals of the Natal Museum* 26 (1): 71-93.

Maggs, Tim 1984b The Iron Age south of the Zambezi, In Richard G. Klein (ed.), *Southern African Prehistory and Paleoenvironments*, A.A.Balkema, Rotterdam, pp. 329-360.

Maggs, Tim 1984c Iron Age settlement and subsistence patterns in the Tugela River basin, Natal, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys, *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 194-206.

Maggs, Tim 1989 The Iron Age farming communities, In Andrew Duminy & Bill Guest (eds.), *Natal and Zululand: From Earliest Times to 1910, A New History*, University of Natal Press, Pietermaritzburg, pp. 28-48.

Maggs, Tim 1994/1995 The Early Iron Age in the extreme south: some patterns and problems, In J.E.G. Sutton (ed.), *The Growth of Farming Communities in Africa from the Equator Southwards, Azania* 29-30: 171-178.

Maggs, Tim; Oswald, Dana; Hall, Martin; & Ruther, Heinz 1986 Spatial parameters of Late Iron Age settlements in the upper Thukela Valley, *Annals of the Natal Museum* 27 (2): 455-479.

Maggs, Tim & Whitelaw, Gavin 1991 A review of recent archaeological research on food-producing communities in southern Africa, *Journal of African History* 32: 3-24.

Marciniak, Arkadiusz 1999 Faunal materials and interpretive archaeology-epistemology reconsidered, *Journal of Archaeological Method and Theory*, 6 (4): 293-320.

Marshall, Fiona 1990 Origins of specialized pastoral production in East Africa. *American Anthropologist* 92 (4): 873-894.

Marshall, Fiona & Pilgram, Tom 1991 Meat versus within-bone nutrients: another look at the meaning of body part representation in archaeological sites, *Journal of Archaeological Science* 18: 149-163.

Marshall, Fiona & Hildebrand, Elisabeth 2002 Cattle before crops: the beginnings of food production in Africa. *Journal of World Prehistory* 16 (2): 99-143.

Mazel, Aaron D. 1989 People making history: the last ten thousand years of hunter-gatherer communities in the Thukela Basin. *Natal Museum, Journal of Humanities* 1: 1-168.

Meyer, A. 1984 A profile of the Iron Age in the Kruger National Park, South Africa In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207. pp. 215-227.

Mitchell, Peter 2002 *The Archaeology of Southern Africa*, Cambridge World Archaeology Series, Cambridge University Press.

Mitchell, Peter 2005 African Connections: an archaeological perspective on Africa and the wider world, Altamira Press, Walnut Creek, CA.

New Webster's Dictionary 1991 *New Webster's Dictionary and Thesaurus: of the English Language*, 1991 Edition, Lexicon Publications, Inc. New York, USA.

Olsen, Sandra L. 1994 Exploitation of mammals at the Early Bronze Age site of West Row Fen (Mildenhall 165), Suffolk, England, *Annals of Carnegie Museum* 63 (2): 115-153.

Olsen, Stanley J. 1971 *Zooarchaeology: animal bones in archaeology and their interpretation*, A Caleb Module in Anthropology, Addison-Wesley Publishing Co.

Olsen, Stanley J. 1979 Archaeologically, what constitutes an early domestic animal? In M. Schiffer (ed.), *Recent Advances in Archaeological Method and Theory*, vol. 2, Academia, New York, pp. 175-199.

Perkins, D. & Daly, P. 1968 A hunter's village in Neolithic Turkey, *Scientific American*, 219(5): 96-106.

Phillipson, David W. 1977 *The Later Prehistory of Eastern and Southern Africa*, Heinemann Educational Books, London, England.

Phillipson, David W. 1993 *African Archaeology* (2nd ed.), Cambridge University Press, Cambridge.

Plug, Ina 1979 Namakala and Nanga: faunal report on two Early Iron Age sites, Zambia, *The South African Archaeological Bulletin* 34 (130): 123-126.

Plug, Ina 1984a Man, Animals and the Subsistence Patterns During the Iron Age in the Kruger National Park, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 228-235.

Plug, Ina 1984b MNI Counts, Pits and Features, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 357-362.

Plug, Ina 1987 An analysis of witchdoctor diving sets, In *Research by the National Cultural History and Open-air Museum* 1 (3): 49-67.

Plug, Ina 1992 The macrofaunal remains of Collingham Shelter, a Late Stone Age site in Natal, *Natal Museum Journal of Humanities* 4: 53-59.

Plug, Ina 1993 The macrofaunal remains of wild animals from Abbot's Cave and Lame Sheep Shelter, Seacow Valley, Cape, *Koedoe* 36 (1): 15-26.

Plug, Ina 1995 Domestic animals during the Early Iron Age in southern Africa, In Gilbert Pwiti and Robert Soper (eds.), *Aspects of African Archaeology: Papers from the 10th Congress of the PanAfrican Association for Prehistory and Related Studies*, University of Zimbabwe Publications, Zimbabwe, pp. 515-520.

Plug, Ina & Voigt Elizabeth A. 1985 archaeozoological studies of Iron Age communities in southern Africa, *Advances in World Archaeology* 4: 189-238, Academic Press Inc.

Plug, Ina & Pistorius, J.C.C. 1999 Animal remains from industrial Iron Age communities in Phalaborwa, South Africa, *African Archaeological Review* 16(3): 155-184.

Prins, F.E. 1995 Climate, Vegetation and early agriculturist communities in Transkei and KwaZulu-Natal, In J.E.G. Sutton (ed.), *The Growth of Farming Communities in Africa from the Equator Southwards*, *Azania* 29-30: 179-186.

Prins, F.E. and Granger, J.E. (1993) Early farming communities in northern Transkei: the evidence from Ntsitsana and adjacent areas. *Natal Museum Journal of Humanities* 5: 153-174.

Rada, V. & Dyson-Hudson, Neville 1970 Food production system of a semi-nomadic society, In Peter F.M. McLoughlin (ed.), *African Food Production Systems: cases and theory*, pp. 91-124, The Johns Hopkins Press, London.

Rackman, J. 1987 Practicality and realism in archaeozoological analysis and interpretation. In C.F. Gaffney and V.L. Gaffney (eds.), *Pragmatic Archaeology: theory in crisis?* pp. 47-69. BAR British Series 167.

Reitz, Elizabeth J. & Wing, Elizabeth S. 1999 *Zooarchaeology*, Cambridge Manuals in Archaeology, Cambridge University Press, Cambridge.

Reid, Andrew 1996 Cattle herds and the redistribution of cattle resources, *World Archaeology* 28 (1): 43-57.

Ryan, Kathleen 2005 Facilitating milk let-down in traditional cattle herding systems: East Africa and beyond, In J. Mulville and A.K. Outram (eds.), *The Zooarchaeology of Fats, Oils, Milk and Dairying*, 9th ICAZ Conference, Durham, 2002, pp. 96-106.

Ryan, Kathleen; Karega-Munene; Kahinju, Samuel; & Kunoni, Paul 1996 Ethnoarchaeology in Kenya Maasailand: managing livestock. In G. Pwiti and R. Soper (eds.), *Aspects of African Archaeology*. Papers from the 10th Congress of the PanAfrican Association for Prehistory and Related Studies, pp. 746-754. Harare, University of Zimbabwe.

Schmitt, Dave N. & Lupo, Karen D. 1995 On mammalian taphonomy, taxonomic diversity, and measuring subsistence data in zooarchaeology, *American Antiquity* 60 (3): 496-514.

Schneider, Harold K. 1979 Livestock and Equality in East Africa: the economic basis for social structure, Indiana University Press, Bloomington.

Schoeman, M.H. 1998 Material culture 'under the animal skin': excavations at esikhunjini, a Mfecane Period Ndzundza Ndebele Site, *Southern African Field Archaeology* 7: 72-81.

Serjeantson, Dale 2000 Good to eat and good to think with: classifying animals from complex sites, In *Animal Bones, Human Societies*; Peter Rowley-Conwy (ed.), Oxbow Books, Oxford and Oakville, pp. 179-189.

Sherratt, Andrew 1981 Plough and pastoralism: aspects of the secondary products revolution. In *Patterns of the Past*; I. Hodder, N. Hammond & G. Isaac (ed.s). Cambridge University Press, Cambridge, pp. 261-305.

Smith, Andrew B. 1992a Origins and spread of pastoralism in Africa, *Annual Review of Anthropology* 21: 125-141.

Smith, Andrew B. 1992b Pastoralism in Africa: Origins and Development Ecology, Hurst & Company, London.

Smith, Andrew B. 1998 Early Domestic stock in southern Africa: a commentary, *African Archaeological Review* 15 (2): 151-156.

Smith, Andrew B. 2000 The origins of the domesticated animals of southern Africa. In Roger Blench & Kevin MacDonald (eds). *The Origins and Development of African Livestock: archaeology, genetics, linguistics and ethnography*, pp. 222-238. UCL Press, New York.

Smith, Andrew B. 2005 African Herders: emergence of pastoral traditions. Altamira Press, Oxford.

Spencer, Lillian M. 1995 Morphological correlates of dietary resource partitioning in the African Bovidae, *Journal of Mammalogy* 76 (2): 448-471.

Speth, John D. 1987 Early hominid subsistence strategies in seasonal habitats, *Journal of Archaeological Science* 14: 13-29.

Stiner, Mary C. 1991 Food procurement and transport by human and non-human predators, *Journal of Archaeological Science* 18: 455-482.

Sullivan, Alan P. 1992 Investigating the archaeological consequence of short-duration occupations, *American Antiquity* 57 (1): 99-115.

Sutton, John E.G. 1995 The South-East, In J.E.G. Sutton (ed.), *The Growth of Farming Communities in Africa from the Equator Southwards*, Azania 29-30: 168-170.

Sutton, Mark Q. & Arkush, Brooke S. 1998 *Archaeological Laboratory Methods: An Introduction 2nd ed.*, Kendall/Hunt Publishing Co., Dubuque, Iowa.

Teeter, Wendy & Chase, Arlen 2004 Adding flesh to bones: using zooarchaeology research to answer the big-picture questions, *Archaeofauna* 13: 155-172.

Thorp, Carolyn R. 1984 A cultural interpretation of the faunal assemblage from Khami Hill Ruin, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 266-276.

Thorp, Carolyn R. 1995 *Kings, Commoners and Cattle: At Zimbabwe Tradition Sites*, Museum Memoir No. 1, Frontline Electronic Publishing Ltd., Harare, Zimbabwe.

Turner, A. 1984 Behavioural inferences based on frequencies in bone assemblages from archaeological sites, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 363-366.

Uerpmann, Hans-Peter 1973 Animal bone finds and economic archaeology: a critical study of 'osteo-archaeological' method, *World Archaeology* 4 (3): 307-322.

van der Merwe, Nikolass J. & Scully, Robert T.K. 1973 The Phalaborwa story: archaeological and ethnographic investigation of a South African Iron Age group, *World Archaeology* 4 (3): 178-196.

van Schalkwyk, Len 1994a Wosi: an Early Iron Age village in the lower Thukela Basin, Natal, *Natal Museum Journal of Humanities* 6: 65-117.

van Schalkwyk, Len 1994b Mamba Confluence: a preliminary report on an industrial centre in the lower Thukela Basin, Natal, *Natal Museum Journal of Humanities* 6: 119-152.

van Schalkwyk, Len 1994/95 Settlement shifts and socio-economic transformations in early agriculturist communities in the lower Thukela Basin, In J.E.G. Sutton (ed.), *The Growth of Farming Communities in Africa from the Equator Southwards*, *Azania* 29-30: 187-198.

van Schalkwyk, Len, Greenfield, Haskel & Jongsma, Tina 1997 The Early Iron Age site of Ndondondwane, KwaZulu-Natal, South Africa: preliminary report on the 1995 excavations, *Southern African Field Archaeology* 6: 61-77.

Voigt, Elizabeth A. 1983 *Mapungubwe: An Archaeological Interpretation of an Iron Age Community*, Transvaal Museum Monograph No.1, Transvaal Museum, Pretoria.

Voigt, Elizabeth A. 1984a The faunal remains from Magogo and Mhlopeni: small stock herding in the Early Iron Age of Natal, *Annals of the Natal Museum* 26 (1): 141-163.

Voigt, Elizabeth A. 1984b Iron Age faunal analysis-problems and possibilities, In M. Hall, G. Avery, D.M. Avery, M.L. Wilson and A.J.B. Humphreys (eds.), *Frontiers: Southern African Archaeology Today*. Cambridge Monographs in African Archaeology 10, BAR International Series 207, pp. 352-356.

Voigt, Elizabeth A. 1984c Iron Age herders of the Northern Transvaal, South Africa, in the First Millennium A.D.. In Juliet Clutton-Brock and Caroline Grigson (eds.), *Animals and Archaeology: 3. Early Herders and their Flocks.* BAR International Series 202, pp. 371-393.

Voigt, Elizabeth A. 1986 Iron Age herding: archaeological and ethnoarchaeological approaches to pastoral problems, In *Prehistoric Pastoralism in Southern Africa*, Martin Hall and Andrew B. Smith (eds.), The South African Archaeological Society, Goodwin Series 5, pp. 13-21.

Voigt, Elizabeth & Plug, Ina 1984 Happy Rest: the earliest Iron Age fauna from the Soutpansberg, *South African Journal of Science* 80: 221-227.

Voigt, Elizabeth A. & von den Driesch, Angel 1984 Preliminary report on the faunal assemblage from Ndondondwane, Natal, *Annals of the Natal Museum* 26 (1): 95-104.

Voigt, Elizabeth A. & Peters, Joris H. 1994a The faunal assemblage from Wosi in the Thukela Valley, Natal. specialist appendix in L.O. Van Schalkwyk, Wosi: an Early Iron Age village in the Lower Thukela Basin, Natal, *Natal Museum Journal of Humanities* 6: 65-117.

Voigt, Elizabeth A. & Peters, Joris H. 1994b The faunal assemblage from the Early Iron Age Site of Mamba I confluence: a preliminary report on an Early Iron Age industrial centre in the Lower Thukela Basin, Natal, *Natal Museum Journal of Humanities* 6: 119-152.

von den Driesch, Angela 1976 *A Guide to the Measurement of Animal Bones from Archaeological Sites*, Cambridge, MA: Harvard University (Peabody Museum Bulletin 1).

Walker, R. 1985 A guide to post-cranial bones of East African animals: Mrs. Walker's bone book. Norwich, England, Hylochoerus Press.

Ward, Val and Maggs. Tim 1988 The slipped disc: a guide to the identification of shell disc-beads, *Annals of the Natal Museum* 29 (2): 407-416.

Waters-Bayer, A. 1986 Supplementary paper 1: dairy subsector of the agro-pastoral household economy, In R. von Kaufmann, S. Chater and R. Blench (eds.), *Livestock Systems Research in Nigeria's Subhumid Zone*. Proceedings of the Second ILCA/NAPRI Symposium Held in Kaduna/ Nigeria, 29 October - 2 November, 1984.

Whitelaw, Gavin 1993 Customs and settlement patterns in the First Millennium AD: evidence from Nanda, an Early Iron Age site in the Mngeni Valley, Natal. *Natal Museum Journal of Humanities* 5: 47-81.

Whitelaw, Gavin 1994 KwaGandaganda: settlement patterns in the Natal Early Iron Age, *Natal Museum Journal of Humanities* 6: 1-64.

Whitelaw, Gavin & Moon, Michael 1996 The ceramics and distribution of pioneer agriculturalists in KwaZulu-Natal, *Natal Museum Journal of Humanities* 8: 53-79.

Wilson, Bob 1992 Considerations for the identification of ritual deposits of animal bones in Iron Age pits, *International Journal of Osteoarchaeology* 2: 341-349.

Yates, Royden 1995 Appendix B: report on the analysis of ostrich eggshell beads from Geduld, *South African Archaeological Bulletin* 50: 17-20.

Zaloumis, E.A. & Cross, Robert 1974 *A Field Guide to the Antelope of Southern Africa*, Natal Branch of the Wildlife Society of Southern Africa, Natal, South Africa.

Figures

Figure 1 Map of southern Africa (Ndondondwane as red star).

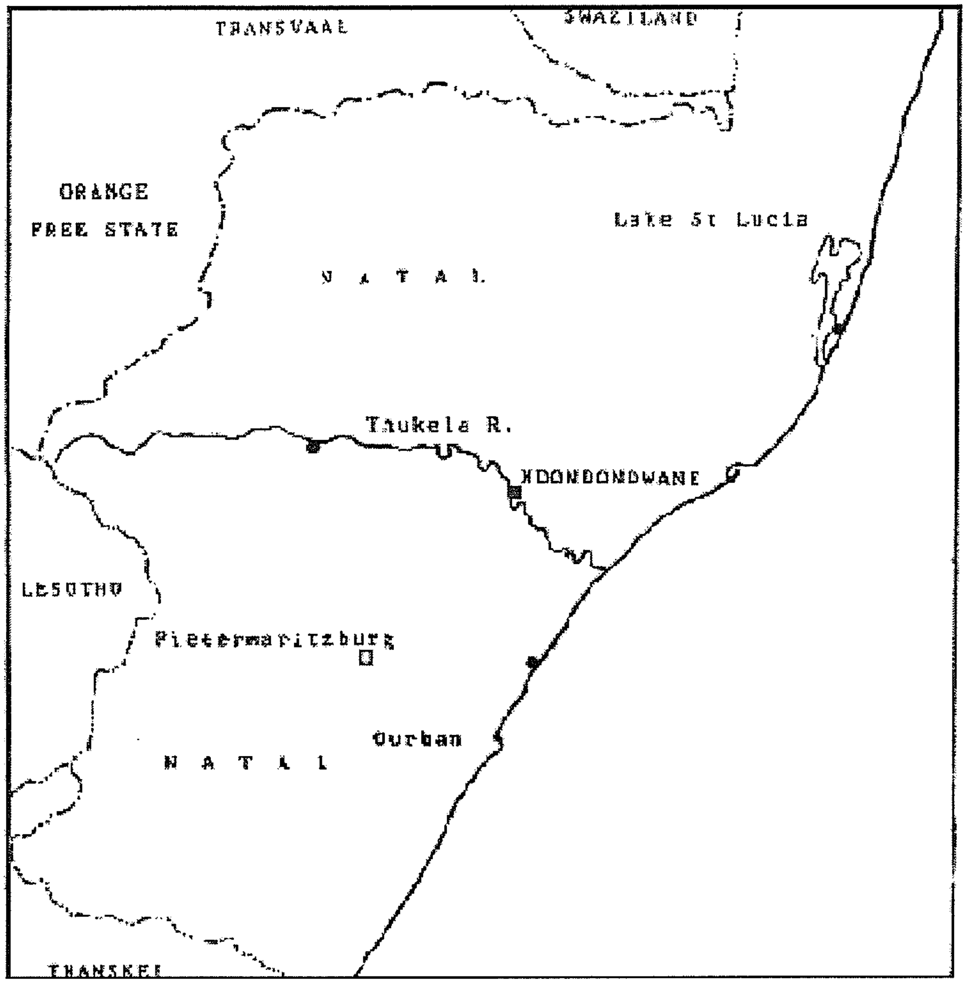


Figure 2. KwaZulu-Natal Province with Thukela River and Ndondondwane.
(Horwitz, Maggs & Ward 1991)*

*** original map by Horwitz, Maggs & Ward (1991), modified by Fread for this paper.**

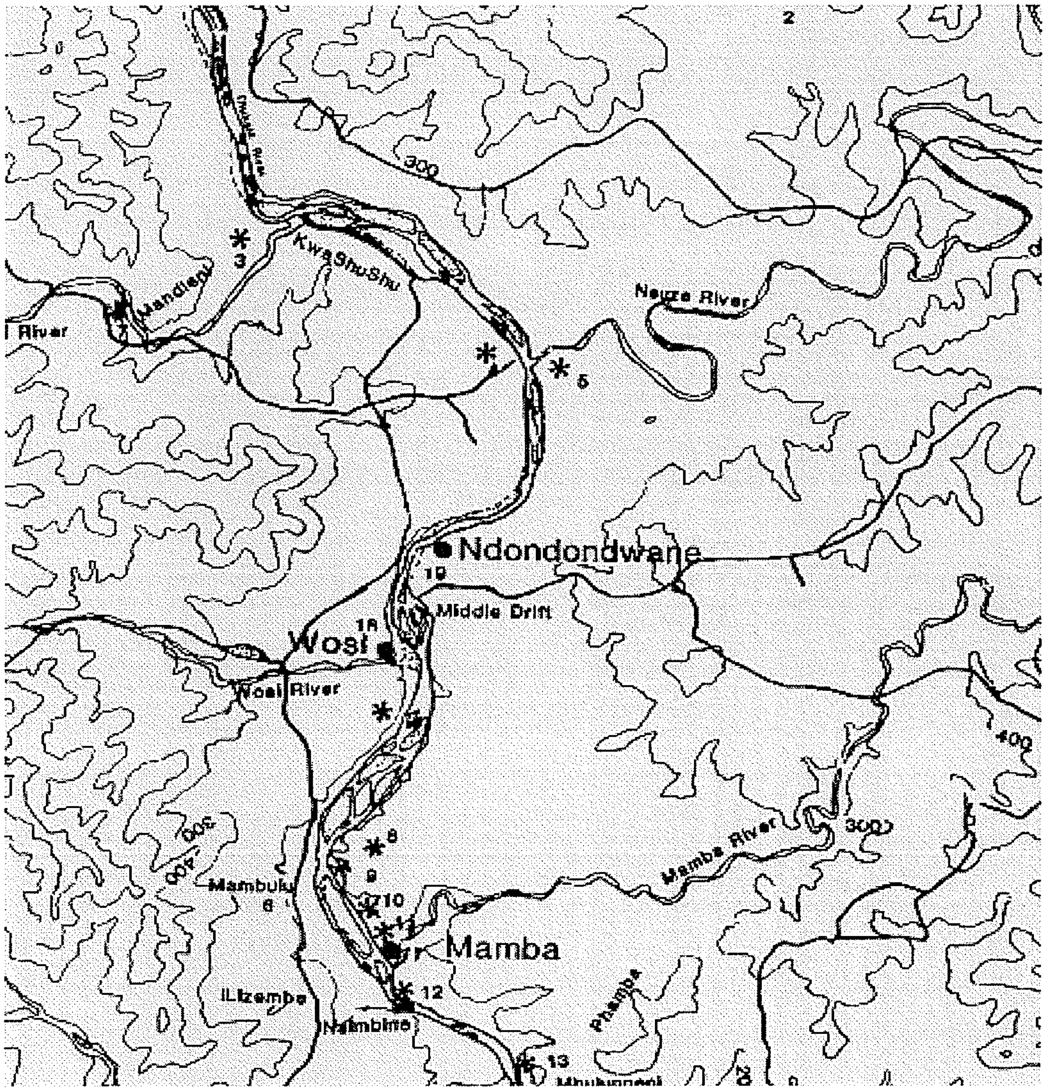


Figure 3 Topographical map of the Thukela River and Ndondondwane. (Courtesy of H. Greenfield)

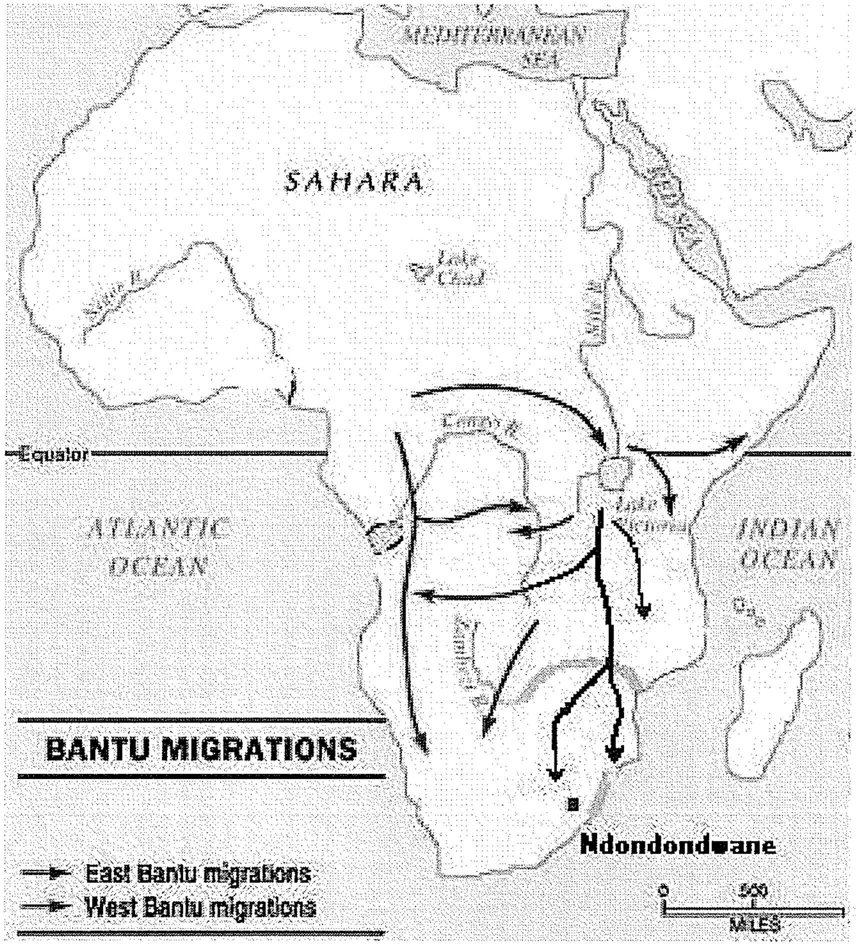


Figure 4. Map demonstrating migrations into southern Africa.

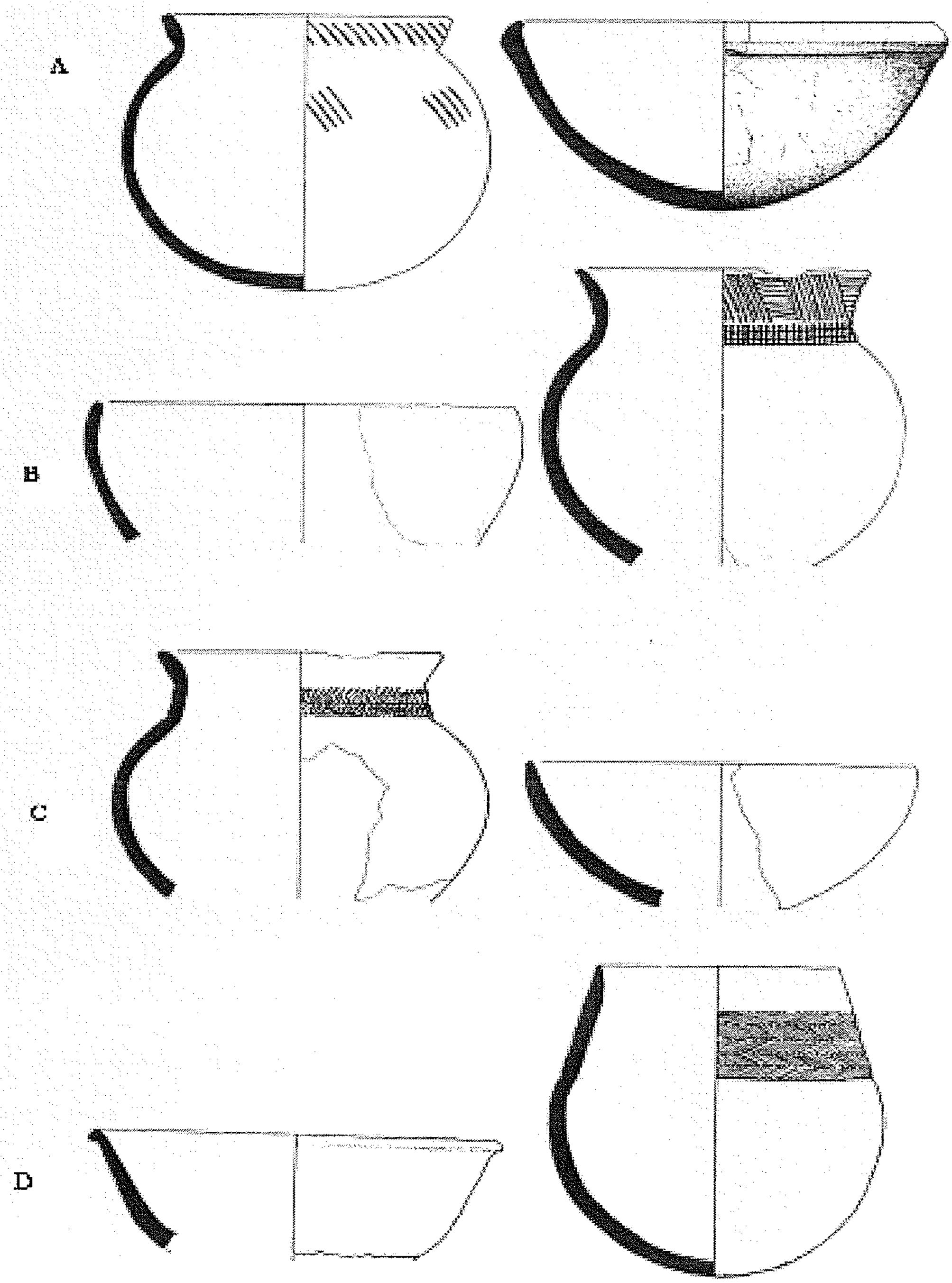


Figure 5 Stylistic differences of EIA pottery. 1) Matola; 2) Msūluzi; 3) Ntshekane; and 4) Ndondondwane (Maggs 1984a).

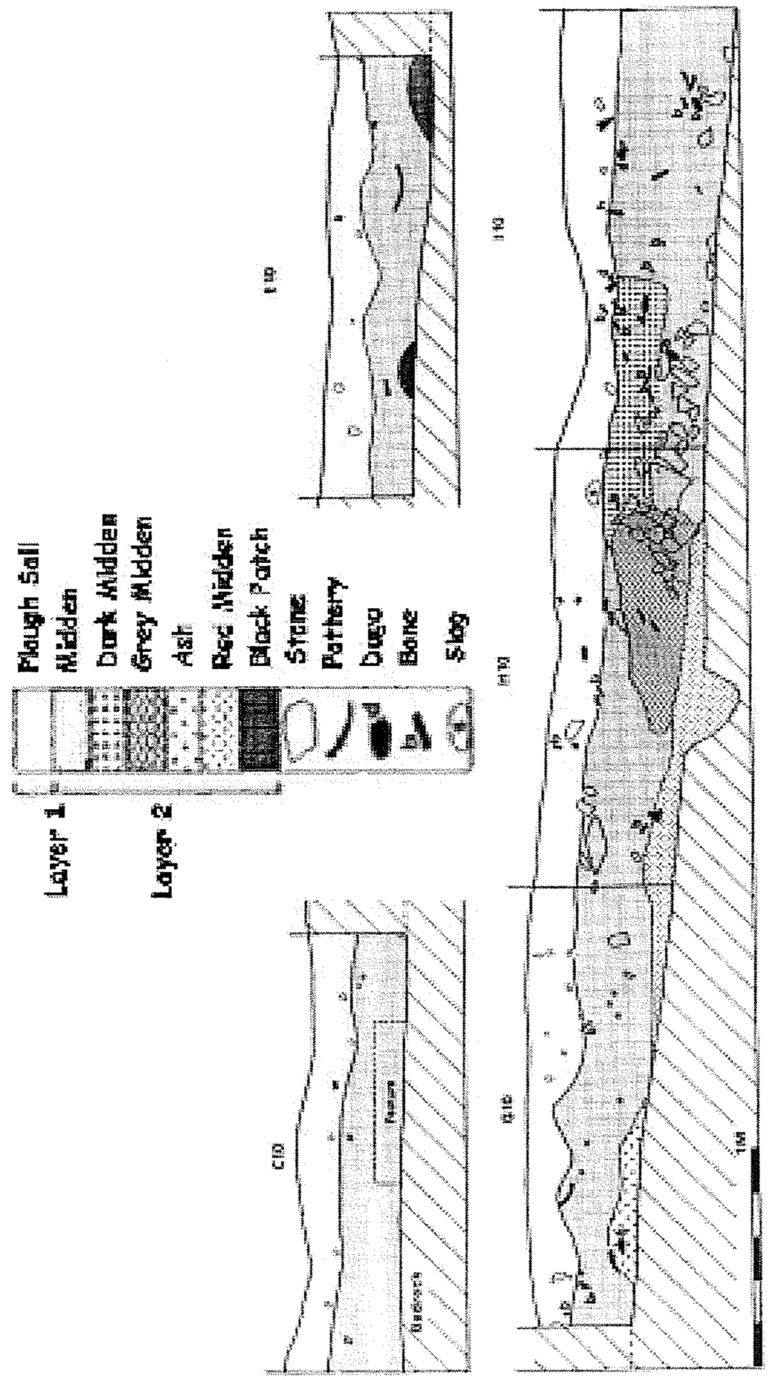


Figure 6 Profile of Mound Area cross-sectioned from C10 to I10 (Maggs 1984a).

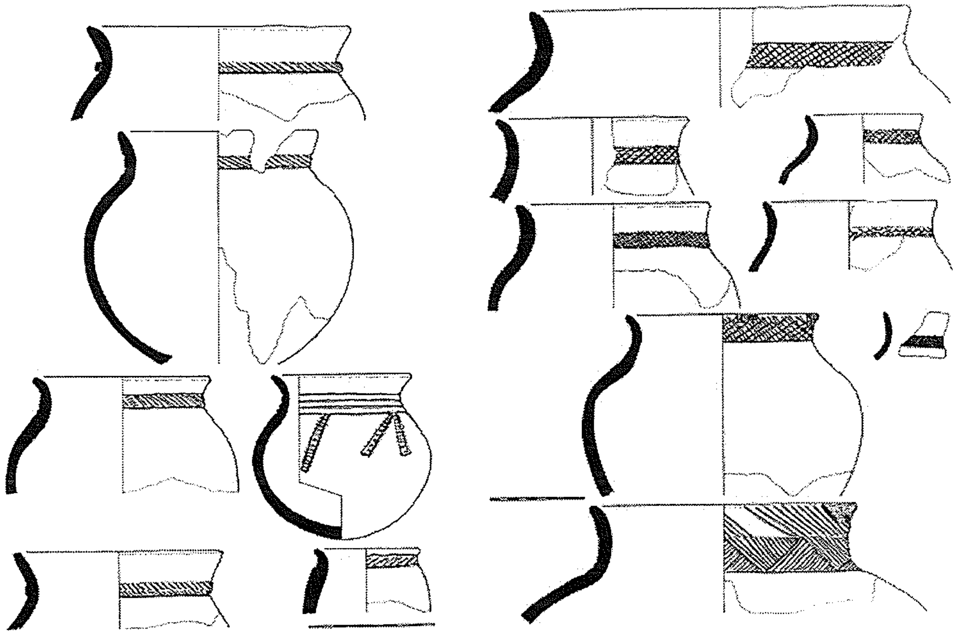


Figure 7 Sketches of typical Ndondondwane Pottery found on Site (Maggs 1984a)

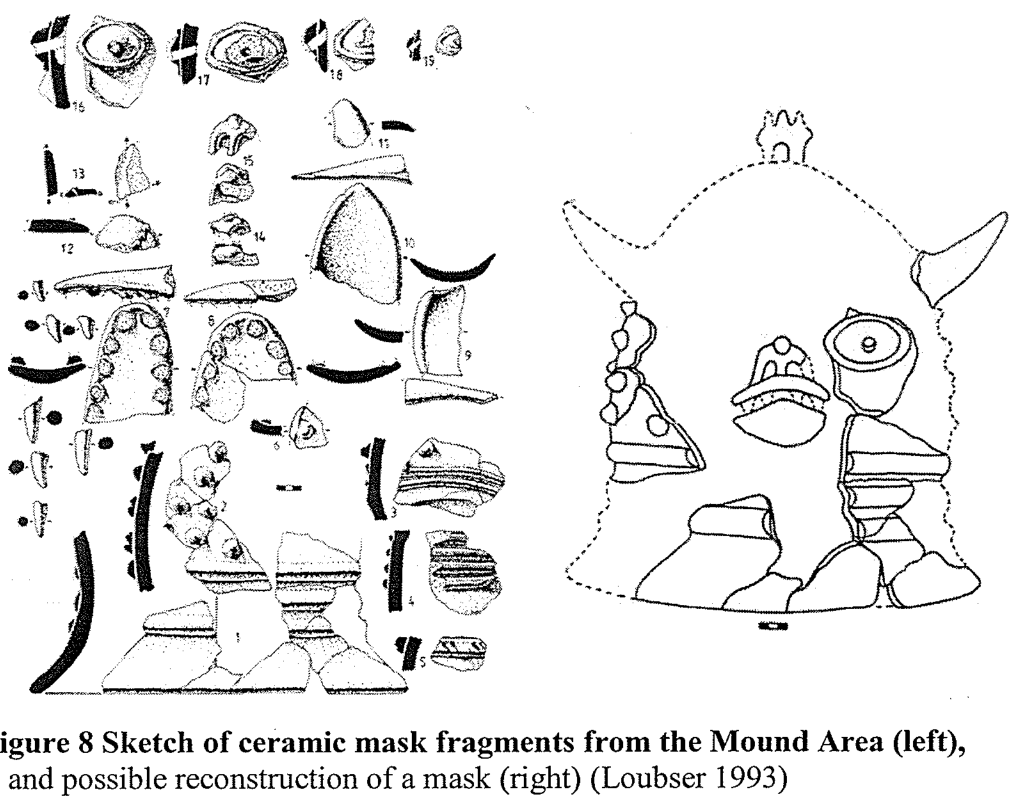


Figure 8 Sketch of ceramic mask fragments from the Mound Area (left), and possible reconstruction of a mask (right) (Loubser 1993)

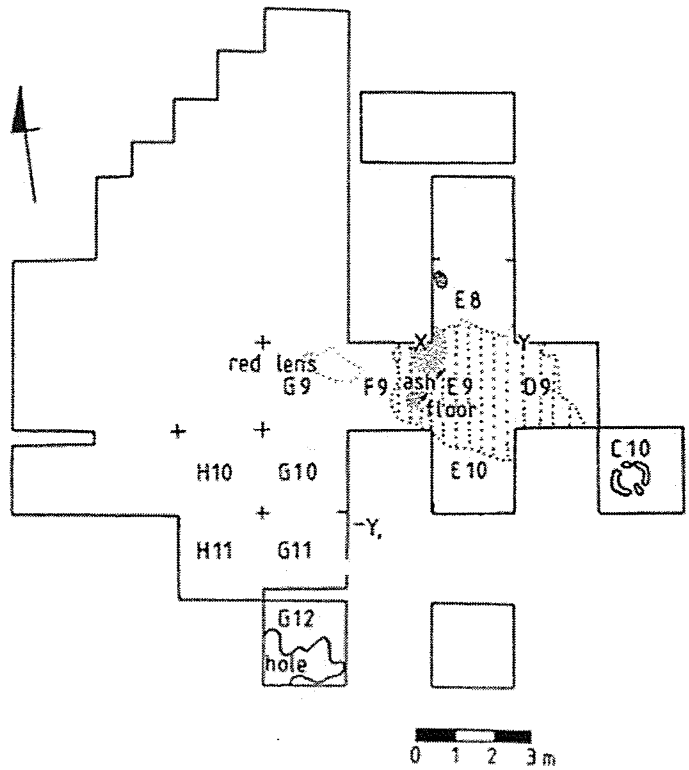


Figure 9 Excavation Plan of Mound Area by Loubser, including features in the lowest horizon (Loubser 1993)

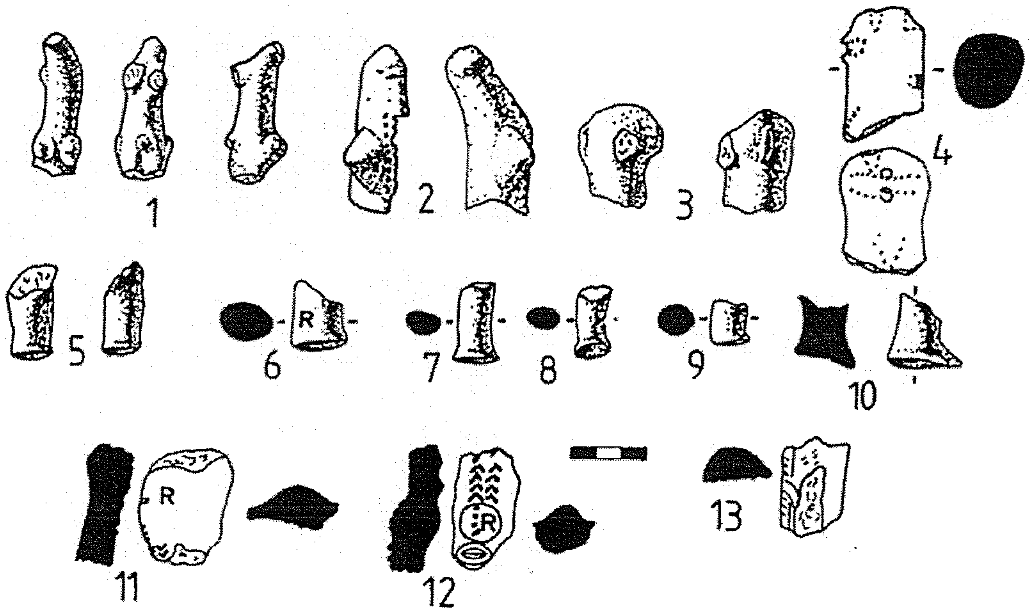


Figure 10. Solid clay figurines exhibiting stylized breasts, buttocks and incised or impressed lines recovered from Ndondondwane.

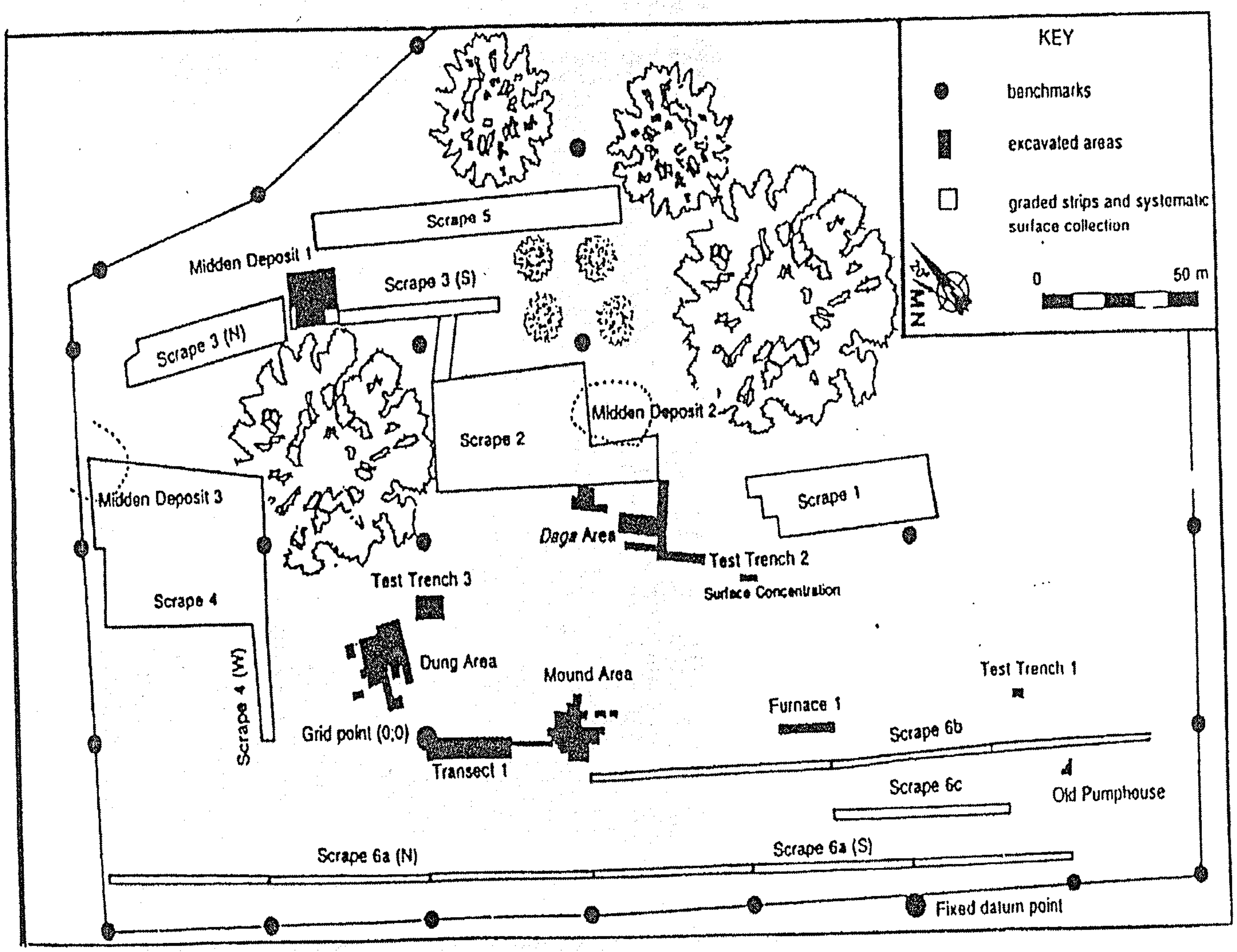
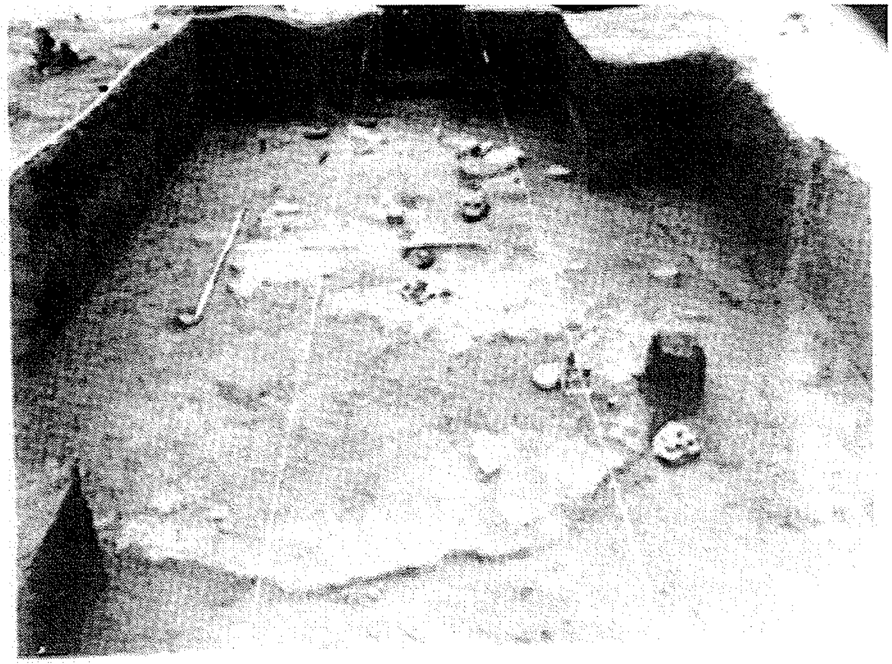


Figure 11 1995 Site plan of Ndondondwane showing excavation and surface scrape and collection areas (Courtesy of H. Greenfield)



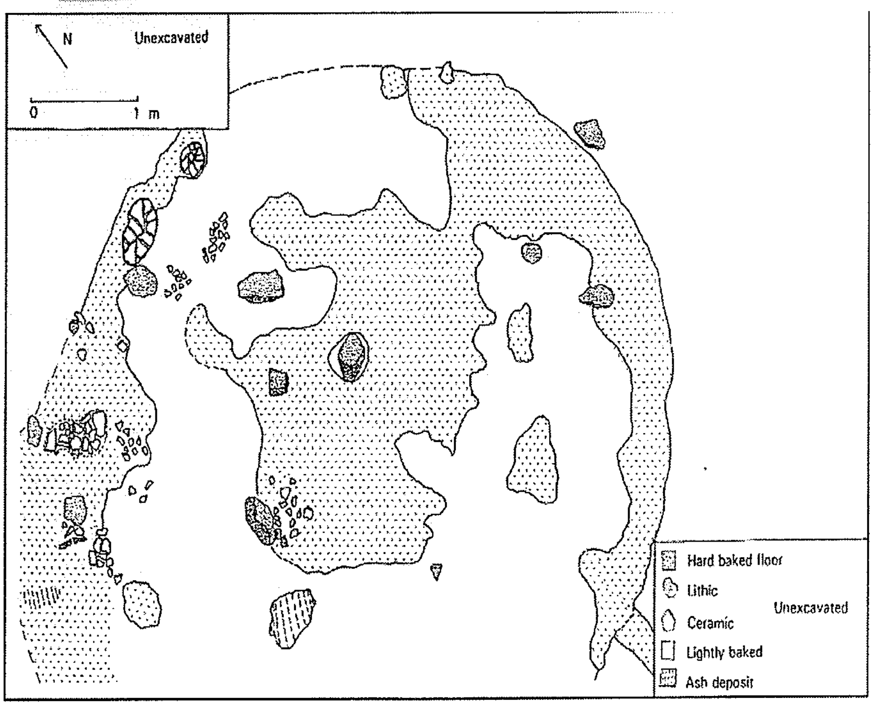
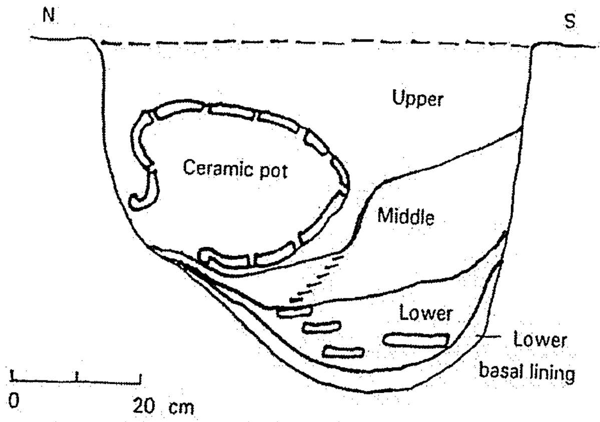


Figure 12. Photo of burnt daga hut floor (top) and sketch of floor (bottom) from Transect 1. (Courtesy of H. Greenfield)



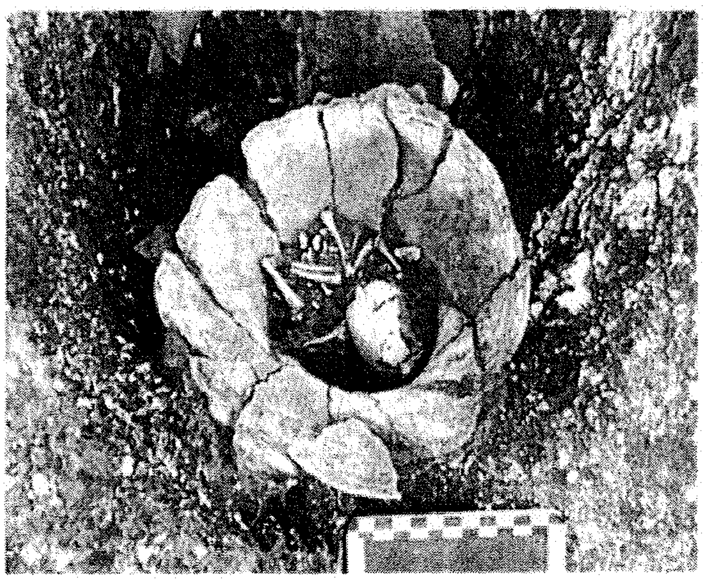


Figure 13. Sketch of profile of Pit 3 (top) and photo of articulated infant burial in pot from Pit 3 (bottom). (Courtesy of H. Greenfield)

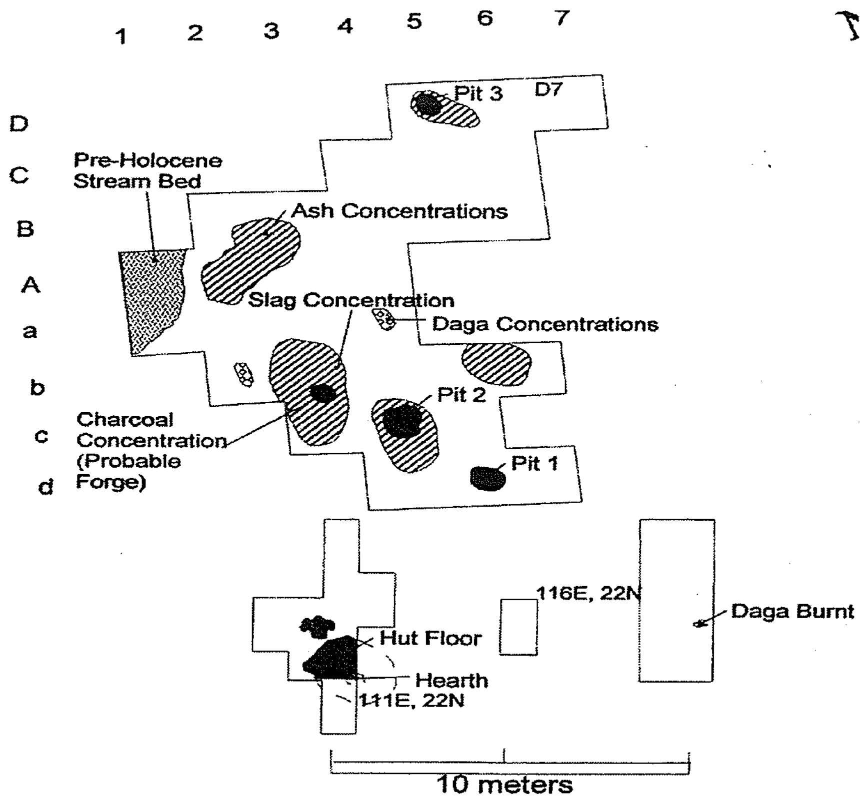


Figure 14. Excavation feature plan for Midden 1. (Greenfield et al. 2003)

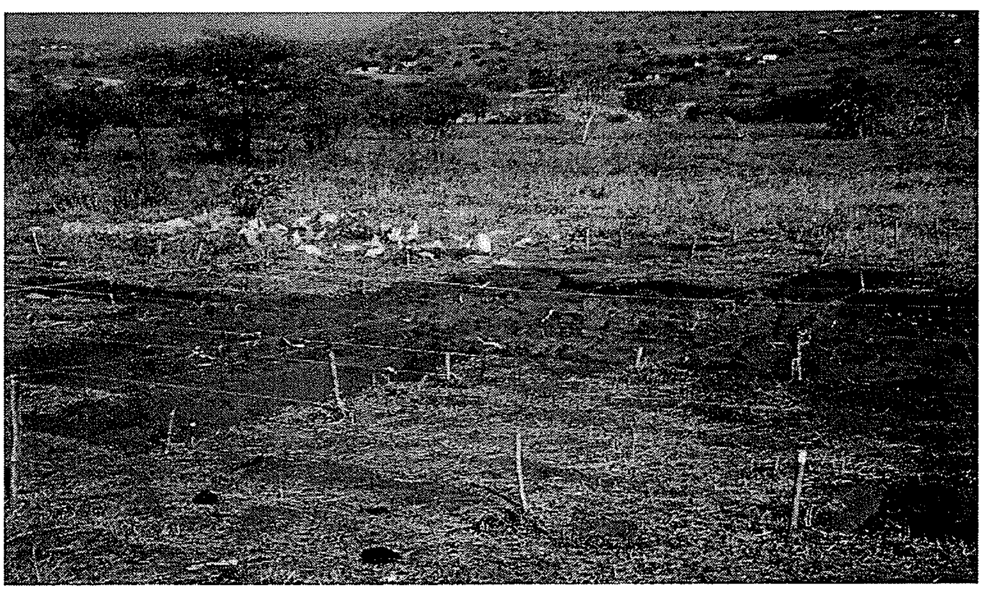


Figure 15. Photo of excavation at Midden 3 (Ivory Midden) with Thukela River in background (Photo © E. Fread).

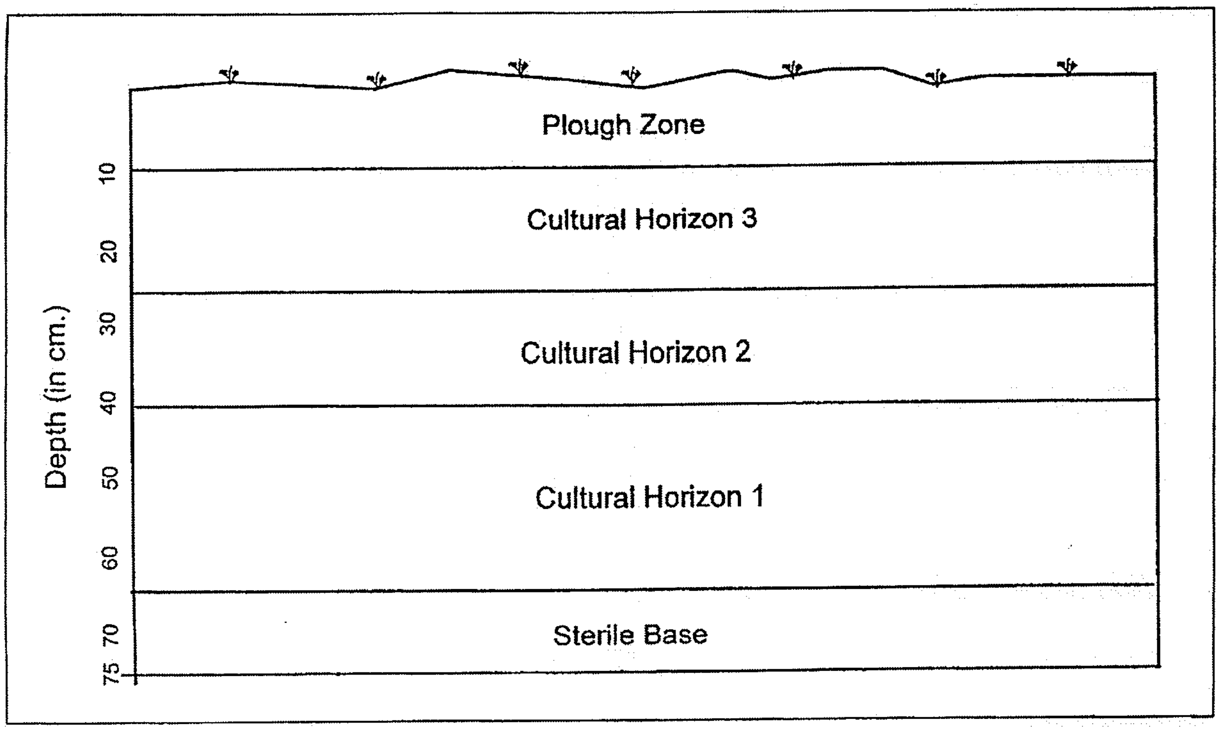


Figure 16 Profile of cross-site stratigraphy (secured horizons) of Ndondondwane
(Courtesy of H. Greenfield)

Figure 17. Harvest profile of domestic species in Lower Horizon

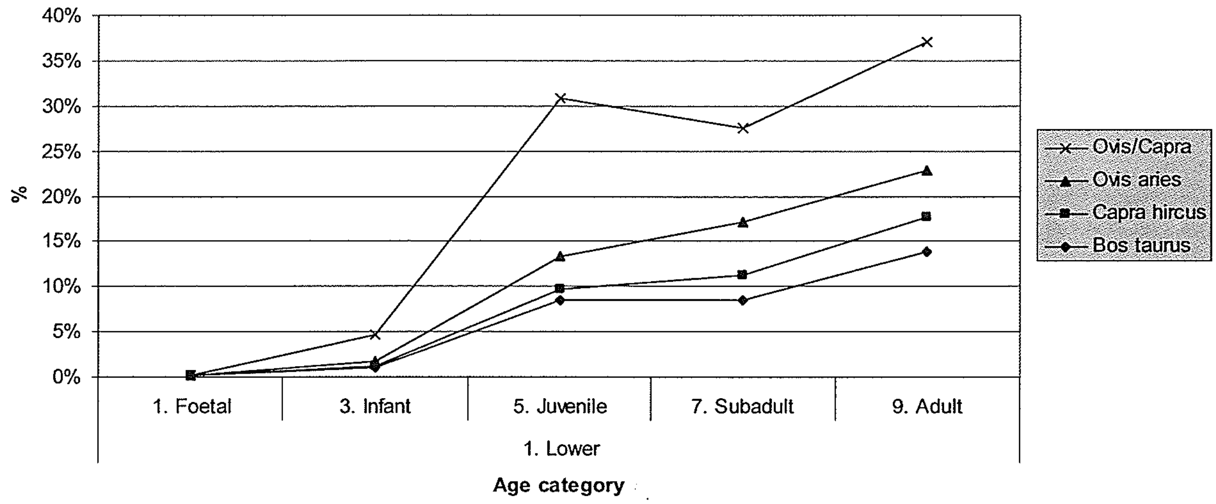


Figure 18. Harvest profile of domestic species in Middle Horizon

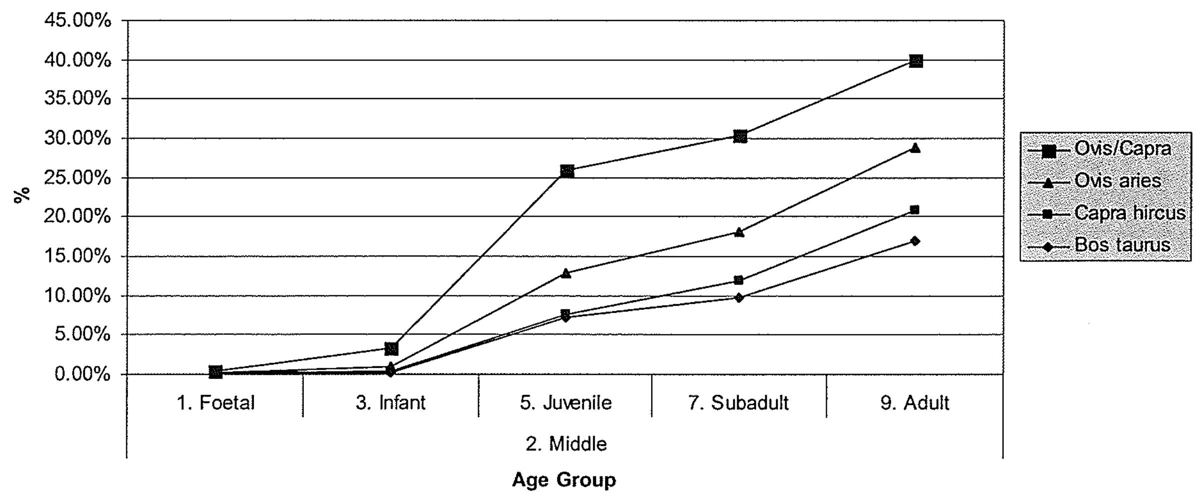


Figure 19. Harvest profile of domestic species in all horizons at Ndondondwane.

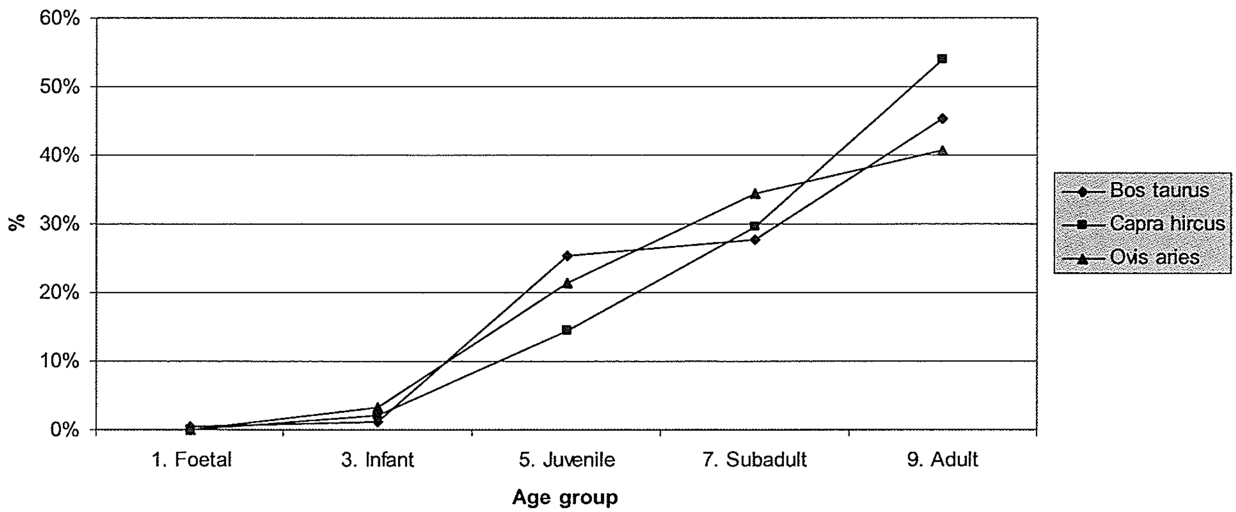
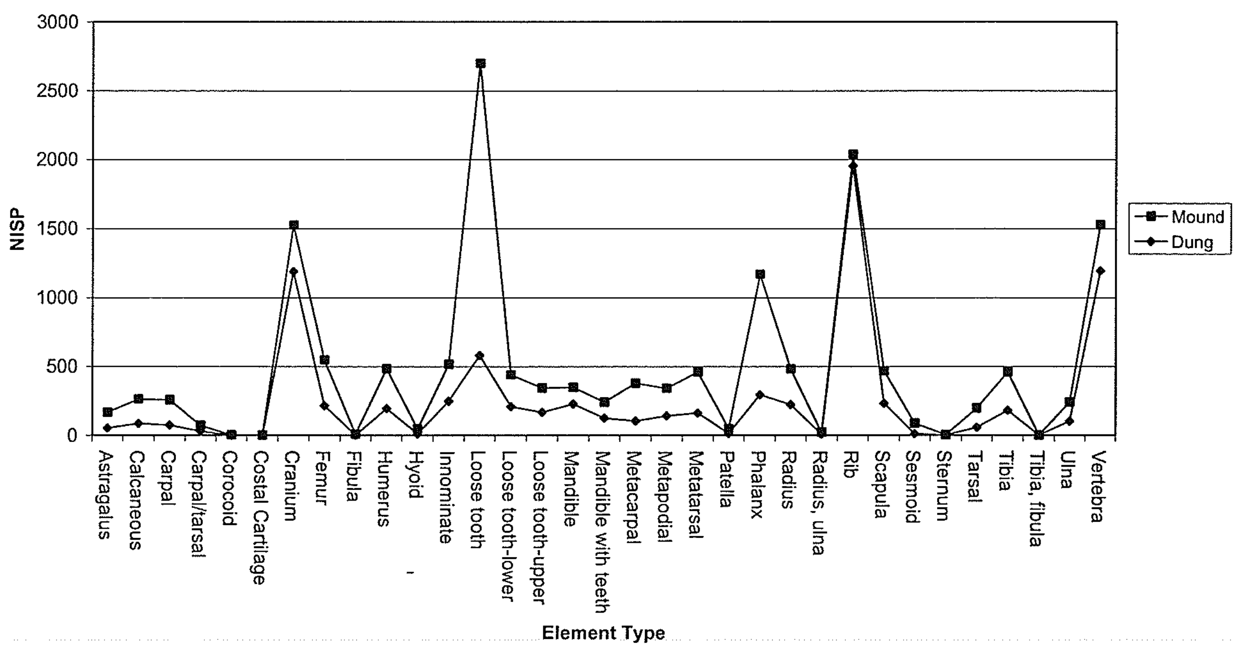


Figure 20. Comparison of element distribution between Dung and Mound Areas.



Tables

Table 1. Total NISP of Ndondondwane by area.

Site Area	NISP	%
Charcoal Preparation		0.00%
Dung	21560	45.83%
Midden 1	1747	3.71%
Midden 2	1780	3.78%
Midden 3	4067	8.64%
Mound	16864	35.84%
Surface	24	0.05%
Transect 1	687	1.46%
Transect 2	319	0.68%
Grand Total	**47048**	**100.00%**

Table 2. Total number of fragments to NISP by site area.

Site Area	Total fragments	NISP
Charcoal Preparation		
Dung	23115	21560
Midden 1	1750	1747
Midden 2	1780	1780
Midden 3	4076	4067
Mound	18887	16864
Surface	24	24
Transect 1	692	687
Transect 2	319	319
Grand Total	**50643**	**47048**

Table 3. Quantification of zooarchaeological assemblage by water displacement (ml).

Site Area	NISP for volume	%	Volume (ml)
Charcoal Preparation		0.00%	
Dung	22531	45.18%	76629
Midden 1	1734	4.17%	7075
Midden 2	1876	4.93%	8365
Midden 3	4737	3.76%	6372
Mound	7569	40.28%	68313
Surface	22	0.03%	50
Transect 1	763	1.49%	2519
Transect 2	125	0.17%	288
Grand Total	**39357**	**100.00%**	**169611**

Table 4. Frequency of identifiable and unidentifiable (in bold) bone fragments by element type.

Element Type	NISP	%
Astragalus	190	0.40%
Body	187	0.40%
Calcaneous	278	0.59%
Carapace	13	0.03%
Carpal	275	0.58%
Carpal/tarsal	93	0.20%
Carpometacarpus	1	0.00%
Columella	22	0.05%
Corocoid	5	0.01%
Costal Cartilage	4	0.01%
Cranium	1782	3.79%
Femur	598	1.27%
Fibula	10	0.02%
Flat bone	**1754**	**3.73%**
Humerus	541	1.15%
Hyoid	49	0.10%
Innominate	555	1.18%
Long bone	**5815**	**12.36%**
Loose tooth	2980	6.33%
Loose tooth-lower	517	1.10%
Loose tooth-upper	381	0.81%
Mandible	411	0.87%
Mandible with teeth	258	0.55%
Metacarpal	402	0.85%
Metapodial	402	0.85%
Metatarsal	481	1.02%
Miscellaneous	5	0.01%
Multiple elements	73	0.16%
Patella	55	0.12%
Phalanx	1276	2.71%
Plastron	4	0.01%
Radius	527	1.12%
Radius, ulna	28	0.06%
Rib	2659	5.65%
Scapula	539	1.15%
Sesamoid	93	0.20%
Sternum	6	0.01%
Tarsal	221	0.47%
Tarsometatarsus	8	0.02%
Tibia	501	1.06%
Tibia, fibula	2	0.00%
Tibiotaurus	2	0.00%
Ulna	265	0.56%
Unidentifiable	**20992**	**44.62%**
Valve	12	0.03%
Vertebra	1775	3.77%
Grand Total	**47048**	**100.00%**

Table 5. Identifiable and unidentifiable (in bold) bone fragments by element type in Dung Area.

Element Type	**NISP**	**%**
Astragalus	54	0.25%
Body	20	0.09%
Calcaneous	86	0.40%
Carapace	2	0.01%
Carpal	75	0.35%
Carpal/tarsal	31	0.14%
Clavicle	1	0.00%
Corocoid	1	0.00%
Costal Cartilage	3	0.01%
Cranium	1188	5.51%
Femur	217	1.01%
Fibula	3	0.01%
Flat bone	**1221**	**5.66%**
Humerus	197	0.91%
Hyoid	13	0.06%
Innominate	248	1.15%
Long bone	**3931**	**18.23%**
Loose tooth	582	2.70%
Loose tooth-lower	210	0.97%
Loose tooth-upper	169	0.78%
Mandible	229	1.06%
Mandible with teeth	126	0.58%
Metacarpal	106	0.49%
Metapodial	143	0.66%
Metatarsal	164	0.76%
Patella	16	0.07%
Phalanx	296	1.37%
Radius	225	1.04%
Radius, ulna	9	0.04%
Rib	1954	9.06%
Scapula	232	1.08%
Sesamoid	12	0.06%
Sternum	4	0.02%
Tarsal	59	0.27%
Tibia	183	0.85%
Tibia, fibula	2	0.01%
Ulna	103	0.48%
Unidentifiable	**8251**	**38.27%**
Vertebra	1194	5.54%
Dung Total	**21560**	**100.00%**

Table 6. Identifiable and unidentifiable (in bold) bone fragments by element type in Mound Area.

Element Type	NISP	%
Astragalus	113	0.67%
Body	155	0.92%
Calcaneous	178	1.06%
Carapace	11	0.07%
Carpal	183	1.09%
Carpal/tarsal	43	0.25%
Carpometacarpus	1	0.01%
Columella	22	0.13%
Corocoid	3	0.02%
Cranium	338	2.00%
Femur	330	1.96%
Fibula	7	0.04%
Flat bone	**10**	**0.06%**
Humerus	286	1.70%
Hyoid	35	0.21%
Innominate	267	1.58%
Long bone	**484**	**2.87%**
Loose tooth	2118	12.56%
Loose tooth-lower	230	1.36%
Loose tooth-upper	175	1.04%
Mandible	120	0.71%
Mandible with teeth	116	0.69%
Metacarpal	273	1.62%
Metapodial	200	1.19%
Metatarsal	295	1.75%
Miscellaneous	5	0.03%
Multiple elements	73	0.43%
Patella	34	0.20%
Phalanx	873	5.18%
Plastron	4	0.02%
Radius	257	1.52%
Radius, ulna	14	0.08%
Rib	85	0.50%
Scapula	235	1.39%
Sesamoid	76	0.45%
Sternum	1	0.01%

Table 6 cont. Identifiable and unidentifiable (in bold) bone fragments by element type in Mound Area

Element Type	NISP	%
Tarsal	139	0.82%
Tarsometatarsus	8	0.05%
Tibia	276	1.64%
Tibiotaurus	2	0.01%
Ulna	139	0.82%
Unidentifiable	**8304**	**49.24%**
Valve	12	0.07%
Vertebra	334	1.98%
Mound Total	**16864**	**100.00%**

Table 7. Identifiable and unidentifiable (in bold) bone fragments by element type in Midden 1.

Element Type	NISP	%
Astragalus	6	0.34%
Body	3	0.17%
Calcaneous	3	0.17%
Carpal	9	0.52%
Carpal/tarsal	1	0.06%
Corocoid	1	0.06%
Cranium	52	2.98%
Femur	17	0.97%
Flat bone	**95**	**5.44%**
Humerus	22	1.26%
Innominate	14	0.80%
Long bone	**432**	**24.73%**
Loose tooth	15	0.86%
Loose tooth-lower	26	1.49%
Loose tooth-upper	7	0.40%
Mandible	38	2.18%
Mandible with teeth	3	0.17%
Metacarpal	9	0.52%
Metapodial	15	0.86%
Metatarsal	13	0.74%
Phalanx	38	2.18%
Radius	15	0.86%
Radius, ulna	4	0.23%
Rib	196	11.22%
Scapula	24	1.37%
Sesamoid	5	0.29%
Sternum	1	0.06%
Tarsal	12	0.69%
Tibia	14	0.80%
Ulna	7	0.40%
Unidentifiable	**552**	**31.60%**
Vertebra	98	5.61%
Midden 1 Total	- **1747**	**100.00%**

Table 8. Identifiable and unidentifiable (in bold) bone fragments by element type in Midden 2.

Element Type	NISP	%
Astragalus	8	0.45%
Body	8	0.45%
Calcaneous	5	0.28%
Carpal	1	0.06%
Cranium	69	3.88%
Femur	16	0.90%
Flat bone	**215**	**12.08%**
Humerus	14	0.79%
Innominate	20	1.12%
Long bone	**387**	**21.74%**
Loose tooth	33	1.85%
Loose tooth-lower	16	0.90%
Loose tooth-upper	14	0.79%
Mandible	7	0.39%
Mandible with teeth	7	0.39%
Metacarpal	6	0.34%
Metapodial	24	1.35%
Metatarsal	4	0.22%
Patella	2	0.11%
Phalanx	27	1.52%
Radius	12	0.67%
Rib	261	14.66%
Scapula	34	1.91%
Tarsal	4	0.22%
Tibia	11	0.62%
Ulna	6	0.34%
Unidentifiable	**495**	**27.81%**
Vertebra	74	4.16%
Midden 2 Total	**1780**	**100.00%**

Table 9. Identifiable and unidentifiable (in bold) bone fragments by element type in Midden 3.

Element Type	NISP	%
Astragalus	7	0.17%
Calcaneous	3	0.07%
Carpal	2	0.05%
Carpal/tarsal	18	0.44%
Costal Cartilage	1	0.02%
Cranium	94	2.31%
Femur	11	0.27%
Flat bone	**109**	**2.68%**
Humerus	10	0.25%
Hyoid	1	0.02%
Innominate	4	0.10%
Long bone	**408**	**10.03%**
Loose tooth	205	5.04%
Loose tooth-lower	23	0.57%
Loose tooth-upper	11	0.27%
Mandible	6	0.15%
Mandible with teeth	3	0.07%
Metacarpal	6	0.15%
Metapodial	13	0.32%
Patella	1	0.02%
Phalanx	33	0.81%
Radius	8	0.20%
Rib	99	2.43%
Scapula	9	0.22%
Tarsal	6	0.15%
Tibia	8	0.20%
Ulna	5	0.12%
Unidentifiable	**2922**	**71.85%**
Vertebra	41	1.01%
Midden 3 Total	**4067**	**100.00%**

Table 10. Identifiable and unidentifiable (in bold) bone fragments by element type in Transect 1.

Element Type	NISP	%
Astragalus	2	0.29%
Calcaneous	2	0.29%
Carpal	5	0.73%
Cranium	34	4.95%
Femur	7	1.02%
Flat bone	**96**	**13.97%**
Humerus	11	1.60%
Innominate	2	0.29%
Long bone	**149**	**21.69%**
Loose tooth	13	1.89%
Loose tooth-lower	7	1.02%
Loose tooth-upper	3	0.44%
Mandible	11	1.60%
Mandible with teeth	2	0.29%
Metacarpal	2	0.29%
Metapodial	7	1.02%
Metatarsal	4	0.58%
Patella	1	0.15%
Phalanx	9	1.31%
Radius	10	1.46%
Radius, ulna	1	0.15%
Rib	59	8.59%
Scapula	4	0.58%
Tibia	9	1.31%
Ulna	4	0.58%
Unidentifiable	**204**	**29.69%**
Vertebra	29	4.22%
Transect 1 Total	**687**	**100.00%**

Table 11. Identifiable and unidentifiable (in bold) bone fragments by element type in Transect 2.

Element Type	NISP	%
Body	1	0.31%
Calcaneous	1	0.31%
Cranium	6	1.88%
Flat bone	**5**	**1.57%**
Long bone	**20**	**6.27%**
Loose tooth	14	4.39%
Loose tooth-lower	5	1.57%
Loose tooth-upper	2	0.63%
Mandible with teeth	1	0.31%
Metatarsal	1	0.31%
Patella	1	0.31%
Rib	4	1.25%
Scapula	1	0.31%
Tarsal	1	0.31%
Ulna	1	0.31%
Unidentifiable	**250**	**78.37%**
Vertebra	5	1.57%
Transect 2 Total	**319**	**100.00%**

Table 12. Identifiable and unidentifiable (in bold) bone fragments by element type on the Surface.

Element Type	NISP	%
Cranium	1	4.17%
Flat bone	3	12.50%
Humerus	1	4.17%
Long bone	**4**	**16.67%**
Rib	1	4.17%
Unidentifiable	**14**	**58.33%**
Surface Total	**24**	**100.00%**

Table 13. NISP frequency by secure horizon.

Secure Horizon	NISP	%
1. Lower	9759	24.00%
2. Middle	20453	50.30%
3. Upper	18	0.04%
3a. Upper	1501	3.69%
3b. Upper	367	0.90%
4. Plough	8537	21.00%
5. Surface	24	0.06%
Grand Total	**40659**	**100.00%**

Table 14. NISP by secure horizon in Dung Area.

Secure Horizon	NISP	%
1. Lower	7781	39.08%
2. Middle	8339	41.88%
3a. Upper	666	3.34%
4. Plough	3126	15.70%
Dung Total	**19912**	**100.00%**

Table 15. NISP by secure horizon in Mound Area.

Secure Horizon	NISP	%
1. Lower	1174	9.68%
2. Middle	5173	42.67%
3b. Upper	367	3.03%
4. Plough	5410	44.62%
Mound Total	**12124**	**100.00%**

Table 16. NISP by secure horizon in Midden 1.

Secure Horizon	NISP	%
2. Middle	986	56.44%
3a. Upper	761	43.56%
Midden 1 Total	**1747**	**100.00%**

Table 17. NISP by secure horizon in Midden 2.

Secure Horizon	NISP	%
2. Middle	1780	100.00%
Midden 2 Total	**1780**	**100.00%**

Table 18. NISP by secure horizon in Midden 3.

Secure Horizon	NISP	%
2. Middle	3993	98.18%
3a. Upper	74	1.82%
Midden 3 Total	**4067**	**100.00%**

Table 19. NISP by secure horizon in Transect 1.

Secure Horizon	NISP	%
1. Lower	557	81.20%
2. Middle	129	18.80%
Transect 1 Total	**686**	**100.00%**

Table 20. NISP by secure horizon in Transect 2.

Secure Horizon	NISP	%
1. Lower	247	77.43%
2. Middle	53	16.61%
3. Upper	18	5.64%
4. Plough	1	0.31%
Transect 2 Total	**319**	**100.00%**

Table 21. List of all identified species at Ndondondwane.

Domestication	Class	Species	NISP	%
Domestic				
	Aves			
		Gallus domesticus	15	0.13%
		Gallus domesticus cf.	2	0.02%
	Aves Total		**17**	**0.14%**
	Mammal			
		Bos taurus	2593	21.74%
		Canis familiaris	108	0.91%
		Capra hircus	532	4.46%
		Capra hircus (dwarf)	3	0.03%
		Ovis aries	1529	12.82%
		Ovis/Capra	4386	36.76%
		Canis familiaris cf.	23	0.19%
	Mammal Total		**9174**	**76.90%**
Domestic Total			**9191**	**77.04%**

Domestication	Class	Species	NISP	%
Not applicable				
	Amphibian			
		Bufo sp.	12	0.10%
	Amphibian Total		**12**	**0.10%**
	Aves			
		Corvus sp	2	0.02%
	Aves Total		**2**	**0.02%**
	Mammal			
		Aethomys chrysophilus	6	0.05%
		Cryptomys hotentotus	10	0.08%
		Homo sapiens sapiens	4	0.03%
		Homo sapiens sapiens?	1	0.01%
		Murid sp.	3	0.03%
		Otomys irroratus	1	0.01%
		Praomys natalensis	51	0.43%
		Rattus rattus	9	0.08%
		Macroscelides proboscideus cf.	1	0.01%
	Mammal Total		**86**	**0.72%**

Table 21 cont. List of all identified species at Ndondondwane.

Domestication	Class	Species	NISP	%
	Reptile			
		Chamaeleo dilepis	1	0.01%
	Reptile Total		**1**	**0.01%**
Not applicable Total			**101**	**0.85%**
Wild				
	Aves			
		Alopochen aegypticus	1	0.01%
		Anas undulata	4	0.03%
		Aves sp.	24	0.20%
		Francolinus natalensis	2	0.02%
		Francolinus sp.	1	0.01%
		Francolinus swainsonii	2	0.02%
		Numida meleagris	2	0.02%
		Struthio camelus	2	0.02%
	Aves Total		**38**	**0.32%**
	Mammal			
		Aepyceros melampus	4	0.03%
		Canis adustus	2	0.02%
		Canis mesomelas	4	0.03%
		Cercopithecus pygerythus	1	0.01%
		Equus sp.	4	0.03%
		Felis sp.	7	0.06%
		Giraffa camelopardalis	4	0.03%
		Hippopotamus amphibius	1348	11.30%
		Hyaena/Crocuta	1	0.01%
		Hystrix africaeaustralis	2	0.02%
		Leporid sp.	9	0.08%
		Lepus sp.	6	0.05%
		Loxodonta africana	560	4.69%
		Oreotragus oreotragus	4	0.03%
		Ourebia ourebi	5	0.04%
		Pedetes capensis	3	0.03%
		Pelea capreolus	1	0.01%
		Pelea capreolus cf.	1	0.01%

Table 21 cont. List of all identified species at Ndondondwane.

Domestication	Class	Species	NISP	%
	Mammal	Phacochoerus aethiopicus	3	0.03%
		Philantomba monticola	2	0.02%
		Potamochoerus porcus	4	0.03%
		Primate sp.	1	0.01%
		Procavia capensis	1	0.01%
		Procavia/Dendrohyrax	4	0.03%
		Raphicerus campestris	10	0.08%
		Raphicerus sp.	2	0.02%
		Redunca arundinum	1	0.01%
		Redunca fulvorufula	8	0.07%
		Suid sp.	14	0.12%
		Sylvicapra grimmia	37	0.31%
		Syncerus caffer	3	0.03%
		Taurotragus oryx	2	0.02%
		Thryonomus swinderianus	4	0.03%
		Tragelaphus angasi	2	0.02%
		Viveridae sp.	1	0.01%
		Viverra civetta	2	0.02%
		Rhinocerotidae sp.	1	0.01%
		Canis sp. cf. Jackal	5	0.04%
		Canis sp.	9	0.08%
	Mammal Total		**2082**	**17.45%**
	Pisces			
		Barbus sp.	5	0.04%
		Clarias sp.	6	0.05%
		Clarias/Synodontis	3	0.03%
		Labeo sp.	2	0.02%
		Sparadon durbanensis	1	0.01%
	Pisces Total		**17**	**0.14%**
	Reptile			
		Agama sp.	2	0.02%
		Crocodilus niloticus	6	0.05%
		Tortoise	18	0.15%
		Varanus niloticus	2	0.02%
		Varanus sp.	124	1.04%
	Reptile Total		**152**	**1.27%**
Wild Total			**2289**	**19.19%**

Table 21 cont. List of all identified species at Ndondondwane.

Domestication	Class	Species	NISP	%
Wild?				
	Aves			
		Aves sp.	8	0.07%
	Aves Total		**8**	**0.07%**
	Mammal			
		Canis sp.	77	0.65%
	Mammal Total		**77**	**0.65%**
Wild? Total			**85**	**0.71%**
Mollusc				
	Mollusc			
		Achatina immaculata	20	0.17%
		Achatina sp.	63	0.53%
		Aspatharia wahlbergi	1	0.01%
		Cellana sp.	1	0.01%
		Freshwater bivalve	1	0.01%
		Marine Mollusc	2	0.02%
		Metachatina kraussi	14	0.12%
		Metachatina sp.	14	0.12%
		Mollusc Shell-Unidentified	88	0.74%
		Nerita sp.	1	0.01%
		Oxystele sinensis	1	0.01%
		Perna perna	2	0.02%
		Unio caffer	3	0.03%
		Unio/Aspatharia	49	0.41%
		Unio/Aspatharia	1	0.01%
		Unionidae	3	0.03%
	Mollusc Total		**264**	**2.21%**
Mollusc Total			**264**	**2.21%**
Grand Total			**11930**	**100.00%**

Table 22. Complete species list for Ndondondwane.

Domestication	Species	Common Name	NISP	%
Domestic				
	Bos taurus	Cow	2593	5.51%
	Canis familiaris	Dog	108	0.23%
	Capra hircus	Goat	532	1.13%
	Capra hircus (dwarf)	Goat-Dwarf	3	0.01%
	Gallus domesticus	Chicken	15	0.03%
	Ovis aries	Sheep	1529	3.25%
	Ovis/Capra	Sheep/Goat	4386	9.32%
	Gallus domesticus cf.	Chicken	2	0.00%
	Canis familiaris cf.	Canid	23	0.05%
Domestic Total			**9191**	**19.54%**

Not applicable				
	Aethomys chrysophilus	Red Veld Shrew	6	0.01%
	Amphibian/Reptile-Unidentifiable	Amphibian/Reptile-Unidentifiable	9	0.02%
	Amphibian-Unidentified	Amphibian-Unidentified	13	0.03%
	Bufo sp.	Toad	11	0.02%
	Toad/frog-Unidentifiable	Toad/Frog	1	0.00%
	Chamaeleo dilepis	Flap-necked chameleon	1	0.00%
	Corvus sp	Raven/Crow	2	0.00%
	Cryptomys hotentotus	Molerat	10	0.02%
	Homo sapiens sapiens	Human	4	0.01%
	Homo sapiens sapiens?	Human	1	0.00%
	Murid sp.	Rodent-Small	2	0.00%
	Rodent-Unidentifiable	Rodent-Unidentifiable	1	0.00%
	Otomys irroratus	Vlei Rat	1	0.00%
	Praomys natalensis	Multunammate Rat	51	0.11%
	Rattus rattus	House Rat	9	0.02%
	Reptile-Small	Reptile-Small	2	0.00%
	Reptile-Unidentifiable	Reptile-Unidentifiable	6	0.01%
	Rodent-Medium	Rodent-Medium	7	0.01%
	Rodent-Small	Rodent-Small	82	0.17%
	Rodent-Unidentifiable	Rodent-Unidentifiable	378	0.80%
	Snake-Unidentified	Snake-Unidentified	1	0.00%
	Macroscelides proboscideus cf.	Elephant Shrew	**1**	**0.00%**
Not applicable Total			**599**	**1.27%**

Table 22 cont. Complete species list for Ndondondwane.

Domestication	**Species**	**Common Name**	**NISP**	**%**
Unknown				
	Bovid Class 1	Bovid Class 1	183	0.39%
	Bovid Class 2	Bovid Class 2	217	0.46%
	Bovid Class 2/3	Bovid Class 2/3	9	0.02%
	Bovid Class 3	Bovid Class 3	94	0.20%
	Mammal-Large	Mammal-Large	4613	9.80%
	Mammal-Medium	Mammal-Medium	8305	17.65%
	Mammal-Small	Mammal-Small	75	0.16%
	Mammal-Unidentifiable	Mammal-Unidentifiable	19539	41.53%
Unknown Total			**33035**	**70.22%**

Wild				
	Aepyceros melampus	Impala	4	0.01%
	Agama sp.	Lizard	2	0.00%
	Alopochen aegypticus	Egyptian Goose	1	0.00%
	Anas undulata	Yellow Billed Duck	4	0.01%
	Aves sp.	Bird-Medium	1	0.00%
	Aves sp.	Bird-Unidentified	23	0.05%
	Barbus sp.	Barbel	5	0.01%
	Bird-Large	Heron?	1	0.00%
	Bird-Small	Bird-Small	4	0.01%
	Bovid Class 1	Bovid Class 1	54	0.11%
	Bovid Class 2	Bovid Class 2	150	0.32%
	Bovid Class 2/3	Bovid Class 2/3	1	0.00%
	Bovid Class 3	Bovid Class 3	129	0.27%
	Bovid Class 4	Bovid Class 4	11	0.02%
	Canis adustus	Side Striped Jackal	2	0.00%
	Canis mesomelas	Blackbacked Jackal	4	0.01%
	Canis sp.	Canid	9	0.02%
	Carnivore Class 1	Carnivore Class 1	8	0.02%
	Carnivore Class 2	Carnivore Class 2	3	0.01%
	Cercopithecus pygerythus	Vervet Monkey	1	0.00%
	Clarias sp.	Catfish	6	0.01%
	Clarias/Synodontis	Catfish	3	0.01%
	Crocodilus niloticus	Crocodile	6	0.01%
	Equus sp.	Equid	4	0.01%
	Felis sp.	Caracal?	1	0.00%
	Felis sp.	Felid	6	0.01%

Table 22 cont. Complete species list for Ndondondwane.

Domestication	Species	Common Name	NISP	%
Wild	Fish-Unidentifiable	Fish-Unidentifiable	169	0.36%
	Francolin size bird	Francolin size bird	1	0.00%
	Francolinus natalensis	Natal Francolin (Pheasant)	2	0.00%
	Francolinus sp.	Pheasant	1	0.00%
	Francolinus swainsonii	Swainson's Francolin (Pheasant)	2	0.00%
	Giraffa camelopardalis	Giraffe	4	0.01%
	Guineafowl size bird	Guinea Fowl Size Bird	1	0.00%
	Hippopotamus amphibius	Hippopotamus	1348	2.87%
	Hyaena/Crocuta	Brown/Spotted Hyaena	1	0.00%
	Hystrix africaeaustralis	Porcupine	2	0.00%
	Labeo sp.	Carp	2	0.00%
	Leporid sp.	Hare/Rabbit	9	0.02%
	Lepus sp.	Hare	2	0.00%
	Lepus sp.	Hare/Rabbit	4	0.01%
	Lizard-Small	Lizard-Small	1	0.00%
	Loxodonta africana	African Elephant	560	1.19%
	Mammal-Small	Mammal-Small	1	0.00%
	Mammal-Very Large	Mammal-Very Large	41	0.09%
	Numida meleagris	Helmeted guineafowl	2	0.00%
	Oreotragus oreotragus	Klipspringer	4	0.01%
	Ourebia ourebi	Oribi	5	0.01%
	Pedetes capensis	Springhare	3	0.01%
	Pelea capreolus	Grey Rhebok	1	0.00%
	Pelea capreolus cf.	Grey Rhebok	1	0.00%
	Phacochoerus aethiopicus	Warthog	3	0.01%
	Philantomba monticola	Blue Duiker	2	0.00%
	Potamochoerus porcus	Bushpig	4	0.01%
	Primate sp.	Primate	1	0.00%
	Procavia capensis	Rock Dassie	1	0.00%
	Procavia/Dendrohyrax	Dassie	4	0.01%
	Raphicerus campestris	Steenbok	10	0.02%
	Raphicerus sp.	Greysbok/Steenbok	2	0.00%
	Redunca arundinum	Reedbuck	1-	0.00%
	Redunca fulvorufula	Mountain Reedbuck	8	0.02%
	Rodent-Large	Rodent-Large	3	0.01%
	Snake-Unidentified	Snake-Unidentified	16	0.03%
	Sparadon durbanensis	Mussel Cracker	1	0.00%

Table 22 cont. Complete species list for Ndondondwane.

Domestication	Species	Common Name	NISP	%
	Struthio camelus	Ostrich	2	0.00%
	Suid sp.	Pig	9	0.02%
	Suid sp.	Suid sp.	5	0.01%
	Sylvicapra grimmia	Common Duiker	37	0.08%
	Syncerus caffer	Cape Buffalo	3	0.01%
	Taurotragus oryx	Eland	2	0.00%
	Thryonomus swinderianus	Greater Cane Rat	4	0.01%
	Tortoise	Tortoise	18	0.04%
	Tragelaphus angasi	Nyala	2	0.00%
	Varanus niloticus	Nile Monitor Lizard	2	0.00%
	Varanus sp.	Monitor Lizard	124	0.26%
	Viveridae sp.	Mongoose	1	0.00%
	Viverra civetta	Civet	2	0.00%
	Rhinocerotidae sp.	Rhinoceros	1	0.00%
	Canis sp. cf. Jackal	Jackal	5	0.01%
Wild Total			**2883**	**6.13%**
Wild?				
	Aves sp.	Bird-Unidentified	8	0.02%
	Bird-Medium	Bird-Medium	2	0.00%
	Bovid Class 1	Bovid Class 1	160	0.34%
	Bovid Class 2	Bovid Class 2	258	0.55%
	Bovid Class 2/3	Bovid Class 2/3	1	0.00%
	Bovid Class 3	Bovid Class 3	529	1.12%
	Bovid Class 4	Bovid Class 4	17	0.04%
	Canis sp.	Canid	77	0.16%
	Guineafowl size bird	Guinea Fowl Size Bird	8	0.02%
	Mammal-Large	Mammal-Large	4	0.01%
	Mammal-Medium	Mammal-Medium	2	0.00%
	Mammal-Small	Mammal-Small	4	0.01%
Wild? Total			**1070**	**2.27%**

Table 22 cont. Complete species list for Ndondondwane.

Domestication	Species	Common Name	NISP	%
Mollusc				
	Achatina immaculata	African giant land snail	20	0.04%
	Achatina sp.	Land Snail	63	0.13%
	Aspatharia wahlbergi	Freshwater Mussel	1	0.00%
	Bivalve-Large	Bivalve-Large	6	0.01%
	Cellana sp.	Limpet	1	0.00%
	Freshwater bivalve	Freshwater Bivalve	1	0.00%
	Marine Mollusc	Marine Mollusc	2	0.00%
	Metachatina kraussi	African giant land snail	14	0.03%
	Metachatina sp.	African giant land snail	14	0.03%
	Mollusc Shell-Unidentified	Mollusc Shell-Unidentified	88	0.19%
	Nerita sp.	Marine Mollusc	1	0.00%
	Oxystele sinensis	Periwinkle Marine Mollusc	1	0.00%
	Perna perna	Brown Mussel	2	0.00%
	Unio caffer	Freshwater Mussel	2	0.00%
	Unio caffer	Freshwater Mussel-Large	1	0.00%
	Unio/Aspatharia	Freshwater Mussel	49	0.10%
	Unio/Aspatharia	Freshwater Mussel	1	0.00%
	Unionidae	Freshwater Mussel	3	0.01%
Mollusc Total			**270**	**0.57%**
Grand Total			47048	100.00%

Table 23. Frequency of mammalian species at Ndondondwane.

Class	Common Name	NISP	%
Mammal			
	African Elephant	560	1.21%
	Blackbacked Jackal	4	0.01%
	Blue Duiker	2	0.00%
	Bovid Class 1	397	0.86%
	Bovid Class 2	625	1.35%
	Bovid Class 2/3	11	0.02%
	Bovid Class 3	752	1.62%
	Bovid Class 4	28	0.06%
	Brown/Spotted Hyaena	1	0.00%
	Bushpig	4	0.01%
	Canis sp.	109	0.24%
	Cape Buffalo	3	0.01%
	Caracal?	1	0.00%
	Carnivore Class 1	8	0.02%
	Carnivore Class 2	3	0.01%
	Civet	2	0.00%
	Common Duiker	37	0.08%
	Cow	2593	5.60%
	Dassie	4	0.01%
	Dog	108	0.23%
	Eland	2	0.00%
	Elephant Shrew	1	0.00%
	Equid	4	0.01%
	Felid	6	0.01%
	Giraffe	4	0.01%
	Goat	532	1.15%
	Goat-Dwarf	3	0.01%
	Greater Cane Rat	4	0.01%
	Grey Rhebok	2	0.00%
	Greysbok/Steenbok	2	0.00%
	Hare	2	0.00%
	Hare/Rabbit	13	0.03%
	Hippopotamus	1348	2.91%
	House Rat	9	0.02%
	Human	5	0.01%
	Impala	4	0.01%
	Jackal	5	0.01%
	Klipspringer	4	0.01%
	Mammal-Large	4617	9.97%
	Mammal-Medium	8307	17.94%
	Mammal-Small	80	0.17%
	Mammal-Unidentifiable	19539	42.20%
	Mammal-Very Large	41	0.09%

Table 23 cont. Frequency of mammalian species at Ndondondwane.

Class	Common Name	NISP	%
Mammal			
	Molerat	10	0.02%
	Mongoose	1	0.00%
	Mountain Reedbuck	8	0.02%
	Multunammate Rat	51	0.11%
	Nyala	2	0.00%
	Oribi	5	0.01%
	Pig	9	0.02%
	Porcupine	2	0.00%
	Primate	1	0.00%
	Red Veld Shrew	6	0.01%
	Reedbuck	1	0.00%
	Rhinoceros	1	0.00%
	Rock Dassie	1	0.00%
	Rodent-Large	3	0.01%
	Rodent-Medium	7	0.02%
	Rodent-Small	84	0.18%
	Rodent-Unidentifiable	379	0.82%
	Sheep	1529	3.30%
	Sheep/Goat	4386	9.47%
	Side Striped Jackal	2	0.00%
	Springhare	3	0.01%
	Steenbok	10	0.02%
	Suid sp.	5	0.01%
	Vervet Monkey	1	0.00%
	Vlei Rat	1	0.00%
	Warthog	3	0.01%
Mammal Total		**46297**	**100.00%**

Table 24. Frequency of bird species at Ndondondwane.

Class	Species	NISP	%
Aves			
	Alopochen aegypticus	1	1.22%
	Anas undulata	4	4.88%
	Aves sp.	32	39.02%
	Aves-Large	1	1.22%
	Aves-Medium	2	2.44%
	Aves-Small	4	4.88%
	Corvus sp	2	2.44%
	Aves-Francolin size bird	1	1.22%
	Francolinus natalensis	2	2.44%
	Francolinus sp.	1	1.22%
	Francolinus swainsonii	2	2.44%
	Gallus domesticus	15	18.29%
	Aves-Guineafowl size bird	9	10.98%
	Numida meleagris	2	2.44%
	Struthio camelus	2	2.44%
	Gallus domesticus cf.	2	2.44%
Aves Total		**82**	**100.00%**

Table 25. Frequency of mollusc species at Ndondondwane.

Class	Species	NISP	%
Mollusc			
	Achatina immaculata	20	7.41%
	Achatina sp.	63	23.33%
	Aspatharia wahlbergi	1	0.37%
	Bivalve-Large	6	2.22%
	Cellana sp.	1	0.37%
	Freshwater bivalve	1	0.37%
	Marine Mollusc	2	0.74%
	Metachatina kraussi	14	5.19%
	Metachatina sp.	14	5.19%
	Mollusc Shell-Unidentified	88	32.59%
	Nerita sp.	1	0.37%
	Oxystele sinensis	1	0.37%
	Perna perna	2	0.74%
	Unio caffer	3	1.11%
	Unio/Aspatharia	49	18.15%
	Unio/Aspatharia	1	0.37%
	Unionidae	3	1.11%
Mollusc Total		**270**	**100.00%**

Table 26. Frequency of fish species at Ndondondwane.

Class	Species	NISP	%
Pisces			
	Barbus sp.	5	2.69%
	Clarias sp.	6	3.23%
	Clarias/Synodontis	3	1.61%
	Pisces sp.-Unidentifiable	169	90.86%
	Labeo sp.	2	1.08%
	Sparadon durbanensis	1	0.54%
Pisces Total		**186**	**100.00%**

Table 27. Frequency of reptile species at Ndondondwane.

Class	Species	NISP	%
Reptile			
	Agama sp.	2	1.12%
	Chamaeleo dilepis	1	0.56%
	Crocodilus niloticus	6	3.35%
	Reptile-Small (lizard)	1	0.56%
	Reptile-Small	2	1.12%
	Reptile-Unidentifiable	6	3.35%
	Reptile-Unidentified (snake)	17	9.50%
	Tortoise	18	10.06%
	Varanus niloticus	2	1.12%
	Varanus sp.	124	69.27%
Reptile Total		**179**	**100.00%**

Table 28. Frequency of amphibian and amphibian/reptile species at Ndondondwane.

Class	Species	NISP	%
Amphibian			
	Amphibian-Unidentified	13	38.24%
	Bufo sp.	12	35.29%
Amphibian Total		**25**	**73.53%**
Amphibian/Reptile			
	Amphibian/Reptile-Unidentifiable	9	26.47%
Amphibian/Reptile Total		**9**	**26.47%**
Grand Total		**34**	**100.00%**

Table 29. Frequency of domestic versus wild species at Ndondondwane.

Domestication	Species	NISP	%
Domestic			
	Bos taurus	2593	19.33%
	Canis familiaris	108	0.81%
	Capra hircus	532	3.97%
	Capra hircus (dwarf)	3	0.02%
	Gallus domesticus	15	0.11%
	Ovis aries	1529	11.40%
	Ovis/Capra	4386	32.70%
	Gallus domesticus cf.	2	0.01%
	Canis familiaris cf.	23	0.17%
Domestic Total		**9191**	**77.59%**

Wild			
	Aepyceros melampus	4	0.03%
	Agama sp.	2	0.01%
	Alopochen aegypticus	1	0.01%
	Anas undulata	4	0.03%
	Aves sp.	24	0.18%
	Barbus sp.	5	0.04%
	Aves-Large	1	0.01%
	Aves-Small	4	0.03%
	Bovid Class 1	54	0.40%
	Bovid Class 2	150	1.12%
	Bovid Class 2/3	1	0.01%
	Bovid Class 3	129	0.96%
	Bovid Class 4	11	0.08%
	Canis adustus	2	0.01%
	Canis mesomelas	4	0.03%
	Canis sp.	9	0.07%
	Carnivore Class 1	8	0.06%
	Carnivore Class 2	3	0.02%
	Cercopithecus pygerythus	1	0.01%
	Clarias sp.	6	0.04%
	Clarias/Synodontis	3	0.02%
	Crocodilus niloticus	6	0.04%
	Equus sp.	4	0.03%
	Felis sp.	7	0.05%
	Pisces-Unidentifiable	169	1.26%

Table 29 cont. Frequency of domestic versus wild species at Ndondondwane.

Domestication	Species	NISP	%
	Aves-Francolin size bird	1	0.01%
	Francolinus natalensis	2	0.01%
	Francolinus sp.	1	0.01%
	Francolinus swainsonii	2	0.01%
	Giraffa camelopardalis	4	0.03%
	Aves-Guineafowl size bird	1	0.01%
	Hippopotamus amphibious(1010 ivory frag)	338	2.5%
	Hyaena/Crocuta	1	0.01%
	Hystrix africaeaustralis	2	0.01%
	Labeo sp.	2	0.01%
	Leporid sp.	9	0.07%
	Lepus sp.	6	0.04%
	Reptile-Small (Lizard)	1	0.01%
	Loxodonta Africana (559 ivory fragments)	1	0.01%
	Mammal-Small	1	0.01%
	Mammal-Very Large	41	0.31%
	Numida meleagris	2	0.01%
	Oreotragus oreotragus	4	0.03%
	Ourebia ourebi	5	0.04%
	Pedetes capensis	3	0.02%
	Pelea capreolus	1	0.01%
	Pelea capreolus cf.	1	0.01%
	Phacochoerus aethiopicus	3	0.02%
	Philantomba monticola	2	0.01%
	Potamochoerus porcus	4	0.03%
	Primate sp.	1	0.01%
	Procavia capensis	1	0.01%
	Procavia/Dendrohyrax	4	0.03%
	Raphicerus campestris	10	0.07%
	Raphicerus sp.	2	0.01%
	Redunca arundinum	1	0.01%
	Redunca fulvorufula	8	0.06%
	Rodent-Large	3	0.02%
	Reptile-Unidentified (snake)	16	0.12%
	Sparadon durbanensis	1	0.01%
	Struthio camelus	2	0.01%
	Suid sp.	14	0.10%

Table 29 cont. Frequency of domestic versus wild species at Ndondondwane.

Domestication	Species	NISP	%
	Sylvicapra grimmia	37	0.28%
	Syncerus caffer	3	0.02%
	Taurotragus oryx	2	0.01%
	Thryonomus swinderianus	4	0.03%
	Tortoise	18	0.13%
	Tragelaphus angasi	2	0.01%
	Varanus niloticus	2	0.01%
	Varanus sp.	124	0.92%
	Viveridae sp.	1	0.01%
	Viverra civetta	2	0.01%
	Rhinocerotidae sp.	1	0.01%
	Canis sp. cf. Jackal	5	0.04%
Wild Total		**1314**	**11.08%**

Wild?			
	Aves sp.	8	0.06%
	Aves-Medium	2	0.01%
	Bovid Class 1	160	1.19%
	Bovid Class 2	258	1.92%
	Bovid Class 2/3	1	0.01%
	Bovid Class 3	529	3.94%
	Bovid Class 4	17	0.13%
	Canis sp.	77	0.57%
	Aves-Guineafowl size bird	8	0.06%
	Mammal-Large	4	0.03%
	Mammal-Medium	2	0.01%
	Mammal-Small	4	0.03%
Wild? Total		**1070**	**9.02%**

Table 29 cont. Frequency of domestic versus wild species at Ndondondwane.

Domestication	Species	NISP	%
Mollusc			
	Achatina immaculata	20	0.15%
	Achatina sp.	63	0.47%
	Aspatharia wahlbergi	1	0.01%
	Bivalve-Large	6	0.04%
	Cellana sp.	1	0.01%
	Freshwater bivalve	1	0.01%
	Marine Mollusc	2	0.01%
	Metachatina kraussi	14	0.10%
	Metachatina sp.	14	0.10%
	Mollusc Shell-Unidentified	88	0.66%
	Nerita sp.	1	0.01%
	Oxystele sinensis	1	0.01%
	Perna perna	2	0.01%
	Unio caffer	3	0.02%
	Unio/Aspatharia	49	0.37%
	Unio/Aspatharia	1	0.01%
	Unionidae	3	0.02%
Mollusc Total		**270**	**2.22%**
Grand Total		**11845**	**100.00%**

Table 30a. Frequency of domestic species by area.

Site Area	Species	NISP	%
Dung			
	Bos taurus	1137	31.84%
	Canis familiaris	35	0.98%
	Capra hircus	176	4.93%
	Gallus domesticus	7	0.20%
	Ovis aries	397	11.12%
	Ovis/Capra	1818	50.91%
	Canis familiaris cf.	1	0.03%
Dung Total		**3571**	**100.00%**
Site Area	**Species**	**NISP**	**%**
Mound			
	Bos taurus	1216	24.45%
	Canis familiaris	73	1.47%
	Capra hircus	348	7.00%
	Capra hircus (dwarf)	3	0.06%
	Ovis aries	1040	20.91%
	Ovis/Capra	2263	45.50%
	Gallus domesticus cf.	2	0.04%
	Canis familiaris cf.	22	0.44%
Mound Total		**4974**	**100.00%**
Site Area	**Species**	**NISP**	**%**
Midden 1			
	Bos taurus	77	31.17%
	Capra hircus	6	2.43%
	Ovis aries	59	23.89%
	Ovis/Capra	105	42.51%
Midden 1 Total		**247**	**100.00%**
Grand Total		**247**	**100.00%**

Site Area	Species	NISP	%
Midden 2			
	Bos taurus	87	38.50%
	Capra hircus	1	0.44%
	Ovis aries	25	11.06%
	Ovis/Capra	113	50.00%
Midden 2 Total		**226**	**100.00%**
Grand Total		**226**	**100.00%**

Table 30a cont. Frequency of domestic species by area.

Site Area	Species	NISP	%
Midden 3			
	Bos taurus	33	46.48%
	Ovis aries	3	4.23%
	Ovis/Capra	35	49.30%
Midden 3 Total		**71**	**100.00%**

Site Area	Species	NISP	%
Transect 1			
	Bos taurus	35	43.75%
	Capra hircus	1	1.25%
	Ovis aries	5	6.25%
	Ovis/Capra	39	48.75%
Transect 1 Total		**80**	**100.00%**

Site Area	Species	NISP	%
Transect 2			
	Bos taurus	8	40.00%
	Ovis/Capra	12	60.00%
Transect 2 Total		**20**	**100.00%**

Table 30b. Frequency of domestic species by secure pan site horizon.

Species	1. Lower NISP	1. Lower %	2. Middle NISP	2. Middle %	3. Upper NISP	3. Upper %	3a. Upper NISP	3a. Upper %	3b. Upper NISP	3b. Upper %	4. Plough NISP	4. Plough %	5. Surface NISP	5. Surface %	Total NISP	Total %
Bos taurus	565	28.62%	1174	29.99%	1	100%	50	25.91%	59	24.38%	369	31.06%		0.00%	2218	29.52%
Canis familiaris	39	1.98%	29	0.74%		0.00%	3	1.55%		0.00%	20	1.68%		0.00%	91	1.21%
Capra hircus	109	5.52%	210	5.36%		0.00%	5	2.59%	27	11.16%	48	4.04%		0.00%	399	5.31%
Capra hircus (dwarf)	3	0.15%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	3	0.04%
Gallus domesticus	5	0.25%	2	0.05%		0.00%		0.00%		0.00%	5	0.42%		0.00%	12	0.16%
Ovis aries	296	14.99%	651	16.63%		0.00%	43	22.28%	61	25.21%	159	13.38%		0.00%	1210	16.10%
Ovis/Capra	950	48.13%	1843	47.08%		0.00%	92	47.67%	93	38.43%	583	49.07%	1	100%	3562	47.40%
Gallus domesticus cf.		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.08%		0.00%	1	0.01%
Canis familiaris cf.	7	0.35%	6	0.15%		0.00%		0.00%	2	0.83%	3	0.25%		0.00%	18	0.24%
Domestic Total	**1974**	**100%**	**3915**	**100%**	**1**	**100%**	**193**	**100%**	**242**	**100%**	**1188**	**100%**	**1**	**100%**	**7514**	**100%**

Table 31. Frequency of domestic species by secure horizon in Dung Area.

	1. Lower		2. Middle		3a. Upper		4. Plough		Total NISP	Total %
Species	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Bos taurus	345	30.67%	585	33.66%	21	19.81%	113	34.66%	1064	32.29%
Canis familiaris	7	0.62%	21	1.21%	3	2.83%	3	0.92%	34	1.03%
Capra hircus	75	6.67%	66	3.80%	5	4.72%	16	4.91%	162	4.92%
Gallus domesticus	4	0.36%	2	0.12%		0.00%	1	0.31%	7	0.21%
Ovis aries	120	10.67%	205	11.80%	16	15.09%	31	9.51%	372	11.29%
Ovis/Capra	573	50.93%	859	49.42%	61	57.55%	162	49.69%	1655	50.23%
Canis familiaris cf.	1	0.09%		0.00%		0.00%		0.00%	1	0.03%
Dung Area Total	**1125**	**100.00%**	**1738**	**100.00%**	**106**	**100.00%**	**326**	**100.00%**	**3295**	**100.00%**

Table 32. Frequency of domestic species by secure horizon in Mound Area.

	1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Species	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Bos taurus	188	24.48%	411	24.15%	59	24.38%	256	29.70%	914	25.57%
Canis familiaris	32	4.17%	8	0.47%		0.00%	17	1.97%	57	1.59%
Capra hircus	33	4.30%	137	8.05%	27	11.16%	32	3.71%	229	6.41%
Capra hircus (dwarf)	3	0.39%		0.00%		0.00%		0.00%	3	0.08%
Gallus domesticus	1	0.13%		0.00%		0.00%	4	0.46%	5	0.14%
Ovis aries	171	22.27%	386	22.68%	61	25.21%	128	14.85%	746	20.87%
Ovis/Capra	334	43.49%	754	44.30%	93	38.43%	421	48.84%	1602	44.82%
Gallus domesticus cf.		0.00%		0.00%		0.00%	1	0.12%	1	0.03%
Canis familiaris cf.	6	0.78%	6	0.35%	2	0.83%	3	0.35%	17	0.48%
Domestic Total	**768**	**100%**	**1702**	**100%**	**242**	**100%**	**862**	**100%**	**3574**	**100%**

Table 33. Frequency of domestic species by secure horizon in Midden 1.

	2. Middle		3a. Upper		Total NISP	Total %
Species	**NISP**	**%**	**NISP**	**%**		
Bos taurus	52	31.14%	25	31.25%	77	31.17%
Capra hircus	6	3.59%		0.00%	6	2.43%
Ovis aries	33	19.76%	26	32.50%	59	23.89%
Ovis/Capra	76	45.51%	29	36.25%	105	42.51%
Midden 1 Total	**167**	**100.00%**	**80**	**100.00%**	**247**	**100.00%**

Table 34. Frequency of domestic species by secure horizon in Midden 2.

	2. Middle		Total NISP	Total %
Species	NISP	%		
Bos taurus	87	38.50%	87	38.50%
Capra hircus	1	0.44%	1	0.44%
Ovis aries	25	11.06%	25	11.06%
Ovis/Capra	113	50.00%	113	50.00%
Midden 2 Total	**226**	**100.00%**	**226**	**100.00%**

Table 35. Frequency of domestic species by secure horizon in Midden 3.

	2. Middle		3a. Upper		Total NISP	Total %
Species	NISP	%	NISP	%		
Bos taurus	29	45.31%	4	57.14%	33	46.48%
Ovis aries	2	3.13%	1	14.29%	3	4.23%
Ovis/Capra	33	51.56%	2	28.57%	35	49.30%
Midden 3 Total	**64**	**100.00%**	**7**	**100.00%**	**71**	**100.00%**

Table 36. Frequency of domesticated species by secure horizon in Transect 1.

	1. Lower		2. Middle		Total NISP	Total %
Species	NISP	%	NISP	%		
Bos taurus	27	42.19%	8	50.00%	35	43.75%
Capra hircus	1	1.56%		0.00%	1	1.25%
Ovis aries	5	7.81%		0.00%	5	6.25%
Ovis/Capra	31	48.44%	8	50.00%	39	48.75%
Transect 1 Total	**64**	**100.00%**	**16**	**100.00%**	**80**	**100.00%**

Table 37. Frequency of domesticated species by secure horizon in Transect 2.

	1. Lower		2. Middle		3. Upper		Total NISP	Total %
Species	NISP	%	NISP	%	NISP	%		
Bos taurus	5	29.41%	2	100.00%	1	100.00%	8	40.00%
Ovis/Capra	12	70.59%		0.00%		0.00%	12	60.00%
Transect 2 Total	**17**	**100.00%**	**2**	**100.00%**	**1**	**100.00%**	**20**	**100.00%**

Table 38. Frequency of wild species at Ndondondwane by area.

Class	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Species	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Aves																
Alopochen aegypticus		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Anas undulata		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Aves sp.	4	0.37%	1	1.10%	1	1.12%		0.00%	16	0.55%	2	4.55%		0.00%	24	0.57%
Bird-Large		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Bird-Small		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Francolin size bird		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Francolinus natalensis		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Francolinus sp.		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Francolinus swainsonii		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Guineafowl size bird		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Numida meleagris		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Struthio camelus		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Aves Total	**4**	**0.37%**	**1**	**1.10%**	**1**	**1.12%**		**0.00%**	**37**	**1.27%**	**2**	**4.55%**		**0.00%**	**45**	**1.07%**

Table 38 cont. Frequency of wild species at Ndondondwane by area.

Species	Dung NISP	Dung %	Midden 1 NISP	Midden 1 %	Midden 2 NISP	Midden 2 %	Midden 3 NISP	Midden 3 %	Mound NISP	Mound %	Transect 1 NISP	Transect 1 %	Transect 2 NISP	Transect 2 %	Total NISP	Total %
Mammal																
Aepyceros melampus	4	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.09%
Bovid Class 1	14	1.31%	2	2.20%	1	1.12%		0.00%	37	1.27%		0.00%		0.00%	54	1.28%
Bovid Class 2	66	6.16%	1	1.10%		0.00%		0.00%	83	2.86%		0.00%		0.00%	150	3.55%
Bovid Class 2/3	1	0.09%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.02%
Bovid Class 3	92	8.59%	3	3.30%	1	1.12%		0.00%	33	1.14%		0.00%		0.00%	129	3.05%
Bovid Class 4	7	0.65%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	11	0.26%
Canis adustus		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Canis mesomelas		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Canis sp.	6	0.56%		0.00%		0.00%		0.00%	3	0.10%		0.00%		0.00%	9	0.21%
Carnivore Class 1		0.00%		0.00%		0.00%		0.00%	8	0.28%		0.00%		0.00%	8	0.19%
Carnivore Class 2	1	0.09%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	3	0.07%
Cercopithecus pygerythus		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Equus sp.	1	0.09%		0.00%		0.00%		0.00%	3	0.10%		0.00%		0.00%	4	0.09%
Felis sp.		0.00%		0.00%		0.00%		0.00%	7	0.24%		0.00%		0.00%	7	0.17%
Giraffa camelopardalis		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Hippopotamus amphibius	33	3.08%	1	1.10%		0.00%	1	5.26%	1313	45.18%		0.00%		0.00%	1348	31.92%
Hyaena/Crocuta		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Hystrix africaeaustralis		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Leporid sp.	2	0.19%	1	1.10%		0.00%		0.00%	6	0.21%		0.00%		0.00%	9	0.21%

Table 38 cont. Frequency of wild species at Ndondondwane by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Lepus sp.	2	0.19%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	6	0.14%
Loxodonta africana	10	0.93%		0.00%		0.00%		0.00%	550	18.93%		0.00%		0.00%	560	13.26%
Mammal-Small		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Mammal-Very Large	23	2.15%	1	1.10%		0.00%		0.00%	17	0.58%		0.00%		0.00%	41	0.97%
Oreotragus oreotragus	1	0.09%		0.00%		0.00%		0.00%	3	0.10%		0.00%		0.00%	4	0.09%
Ourebia ourebi	5	0.47%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	5	0.12%
Pedetes capensis	3	0.28%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	3	0.07%
Pelea capreolus		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Pelea capreolus cf.		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Phacochoerus aethiopicus		0.00%	1	1.10%		0.00%		0.00%	2	0.07%		0.00%		0.00%	3	0.07%
Philantomba monticola		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Potamochoerus porcus		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Primate sp.		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Procavia capensis	1	0.09%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.02%
Procavia/Dendrohyrax		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Raphicerus campestris		0.00%		0.00%		0.00%		0.00%	10	0.34%		0.00%		0.00%	10	0.24%
Raphicerus sp.		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%

Table 38 cont. Frequency of wild species at Ndondondwane by area.

Class	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Species	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Redunca arundinum		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Redunca fulvorufula	1	0.09%		0.00%		0.00%		0.00%	7	0.24%		0.00%		0.00%	8	0.19%
Rodent-Large	2	0.19%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	3	0.07%
Suid sp.		0.00%		0.00%		0.00%		0.00%	14	0.48%		0.00%		0.00%	14	0.33%
Sylvicapra grimmia	12	1.12%		0.00%		0.00%		0.00%	25	0.86%		0.00%		0.00%	37	0.88%
Syncerus caffer	2	0.19%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	3	0.07%
Taurotragus oryx		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Thryonomus swinderianus		0.00%		0.00%		0.00%		0.00%	4	0.14%		0.00%		0.00%	4	0.09%
Tragelaphus angasi		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Viveridae sp.	1	0.09%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.02%
Viverra civetta	1	0.09%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	2	0.05%
Rhinocerotidae sp.		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Canis sp. cf. Jackal		0.00%		0.00%		0.00%		0.00%	5	0.17%		0.00%		0.00%	5	0.12%
Mammal Total	**291**	**27.17%**	**10**	**10.99%**	**2**	**2.25%**	**1**	**5.26%**	**2179**	**74.98%**		**0.00%**		**0.00%**	**2483**	**58.80%**
Pisces																
Barbus sp.		0.00%		0.00%		0.00%		0.00%	5	0.17%		0.00%		0.00%	5	0.12%
Clarias sp.		0.00%		0.00%		0.00%		0.00%	6	0.21%		0.00%		0.00%	6	0.14%
Clarias/Synodontis	3	0.28%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	3	0.07%
Fish-Unidentifiable	9	0.84%	3	3.30%		0.00%	2	10.53%	155	5.33%		0.00%		0.00%	169	4.00%
Labeo sp.		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Sparadon durbanensis		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Pisces Total	**12**	**1.12%**	**3**	**3.30%**		**0.00%**	**2**	**10.53%**	**169**	**5.82%**		**0.00%**		**0.00%**	**186**	**4.40%**

Table 38 cont. Frequency of wild species at Ndondondwane by area.

Class	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Reptile																
Agama sp.		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Crocodilus niloticus	2	0.19%		0.00%		0.00%	1	5.26%	3	0.10%		0.00%		0.00%	6	0.14%
Lizard-Small		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Snake-Unidentified		0.00%		0.00%		0.00%		0.00%	16	0.55%		0.00%		0.00%	16	0.38%
Tortoise	2	0.19%		0.00%		0.00%		0.00%	16	0.55%		0.00%		0.00%	18	0.43%
Varanus niloticus	2	0.19%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.05%
Varanus sp.	2	0.19%		0.00%		0.00%		0.00%	122	4.20%		0.00%		0.00%	124	2.94%
Reptile Total	**8**	**0.75%**		**0.00%**		**0.00%**	**1**	**5.26%**	**160**	**5.51%**		**0.00%**		**0.00%**	**169**	**4.00%**
Wild Total	**315**	**29.41%**	**14**	**15.38%**	**3**	**3.37%**	**4**	**21.05%**	**2545**	**87.58%**	**2**	**4.55%**		**0.00%**	**2883**	**68.27%**
Wild?																
Aves																
Aves sp.	5	0.47%	1	1.10%		0.00%		0.00%	2	0.07%		0.00%		0.00%	8	0.19%
Bird-Medium	2	0.19%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.05%
Guineafowl size bird		0.00%		0.00%		0.00%		0.00%	8	0.28%		0.00%		0.00%	8	0.19%
Aves Total	**7**	**0.65%**	**1**	**1.10%**		**0.00%**		**0.00%**	**10**	**0.34%**		**0.00%**		**0.00%**	**18**	**0.43%**
Mammal																
Bovid Class 1	130	12.14%	14	15.38%	4	4.49%		0.00%	3	0.10%	9	20.45%		0.00%	160	3.79%
Bovid Class 2	196	18.30%	12	13.19%	11	12.36%	6	31.58%	21	0.72%	12	27.27%		0.00%	258	6.11%
Bovid Class 2/3		0.00%		0.00%		0.00%	1	5.26%		0.00%		0.00%		0.00%	1	0.02%
Bovid Class 3	373	34.83%	47	51.65%	58	65.17%	8	42.11%	20	0.69%	21	47.73%	2	66.67%	529	12.53%
Bovid Class 4	6	0.56%		0.00%	4	4.49%		0.00%	7	0.24%		0.00%		0.00%	17	0.40%

Table 38 cont. Frequency of wild species at Ndondondwane by area.

Class	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Canis sp.	14	1.31%		0.00%		0.00%		0.00%	63	2.17%		0.00%		0.00%	77	1.82%
Mammal-Large	4	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.09%
Mammal-Medium	1	0.09%		0.00%	1	1.12%		0.00%		0.00%		0.00%		0.00%	2	0.05%
Mammal-Small	3	0.28%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	4	0.09%
Mammal Total	**727**	**67.88%**	**73**	**80.22%**	**78**	**87.64%**	**15**	**78.95%**	**115**	**3.96%**	**42**	**95.45%**	**2**	**66.67%**	**1052**	**24.91%**
Wild? Total	**734**	**68.53%**	**74**	**81.32%**	**78**	**87.64%**	**15**	**78.95%**	**125**	**4.30%**	**42**	**95.45%**	**2**	**66.67%**	**1070**	**25.34%**
Mollusc																
Achatina immaculata	1	0.09%	1	1.10%	1	1.12%		0.00%	17	0.58%		0.00%		0.00%	20	0.47%
Achatina sp.	1	0.09%		0.00%		0.00%		0.00%	62	2.13%		0.00%		0.00%	63	1.49%
Aspatharia wahlbergi	1	0.09%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.02%
Bivalve-Large		0.00%		0.00%		0.00%		0.00%	6	0.21%		0.00%		0.00%	6	0.14%
Cellana sp.		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Freshwater bivalve		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Marine Mollusc		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Metachatina kraussi		0.00%		0.00%	1	1.12%		0.00%	13	0.45%		0.00%		0.00%	14	0.33%
Metachatina sp.		0.00%		0.00%		0.00%		0.00%	14	0.48%		0.00%		0.00%	14	0.33%
Mollusc Shell-Unidentified	8	0.75%	1	1.10%		0.00%		0.00%	79	2.72%		0.00%		0.00%	88	2.08%
Nerita sp.		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%

Table 38 cont. Frequency of wild species at Ndondondwane by area.

Class	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Species	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Oxystele sinensis		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Perna perna		0.00%		0.00%		0.00%		0.00%	2	0.07%		0.00%		0.00%	2	0.05%
Unio caffer	1	0.09%		0.00%	1	1.12%		0.00%	1	0.03%		0.00%		0.00%	3	0.07%
Unio/Aspatharia	7	0.65%	1	1.10%	5	5.62%		0.00%	35	1.20%		0.00%	1	33.33%	49	1.16%
Unio/Aspatharia		0.00%		0.00%		0.00%		0.00%	1	0.03%		0.00%		0.00%	1	0.02%
Unionidae	3	0.28%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	3	0.07%
Mollusc Total	**22**	**2.05%**	**3**	**3.30%**	**8**	**8.99%**		**0.00%**	**236**	**8.12%**		**0.00%**	**1**	**33.33%**	**270**	**6.39%**
Grand Total	**1071**	**100%**	**91**	**100%**	**89**	**100%**	**19**	**100%**	**2906**	**100%**	**44**	**100%**	**3**	**100%**	**4223**	**100%**

Table 39. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
1. Lower				
	Wild			
		Aepyceros melampus	3	0.11%
		Alopochen aegypticus	1	0.04%
		Anas undulata	1	0.04%
		Aves sp.	6	0.23%
		Barbus sp.	2	0.08%
		Bird-Large	1	0.04%
		Bird-Small	2	0.08%
		Bovid Class 1	12	0.45%
		Bovid Class 2	28	1.05%
		Bovid Class 3	32	1.20%
		Bovid Class 4	5	0.19%
		Canis mesomelas	2	0.08%
		Canis sp.	2	0.08%
		Clarias sp.	2	0.08%
		Clarias/Synodontis	2	0.08%
		Pisces-Unidentifiable	23	0.86%
		Francolinus swainsonii	1	0.04%
		Aves-Guineafowl size bird	1	0.04%
		Hippopotamus amphibius	74	2.78%
		Leporid sp.	2	0.08%
		Lepus sp.	1	0.04%
		Loxodonta africana	3	0.11%
		Mammal-Very Large	20	0.75%
		Numida meleagris	1	0.04%
		Ourebia ourebi	1	0.04%
		Pedetes capensis	1	0.04%
		Philantomba monticola	1	0.04%
		Potamochoerus porcus	1	0.04%
		Redunca fulvorufula	1	0.04%
		Struthio camelus	1	0.04%
		Suid sp.	5	0.19%
		Sylvicapra grimmia	7	0.26%
		Tortoise	3	0.11%
		Varanus sp.	3	0.11%
	Wild Total		**251**	**9.44%**

Table 39. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
1. Lower				
	Wild?			
		Aves sp.	1	0.04%
		Bovid Class 1	50	1.88%
		Bovid Class 2	75	2.82%
		Bovid Class 3	79	2.97%
		Bovid Class 4	3	0.11%
		Canis sp.	15	0.56%
		Aves-Guineafowl size bird	1	0.04%
	Wild? Total		**224**	**8.42%**
	Mollusc			
		Achatina immaculata	1	0.04%
		Achatina sp.	29	1.09%
		Bivalve-Large	6	0.23%
		Cellana sp.	1	0.04%
		Metachatina kraussi	1	0.04%
		Metachatina sp.	5	0.19%
		Mollusc Shell-Unidentified	16	0.60%
		Unio/Aspatharia	1	0.04%
		Unio/Aspatharia	1	0.04%
		Unionidae	3	0.11%
	Mollusc Total		**64**	**2.41%**
1. Lower Total			**539**	**20.26%**
2. Middle				
	Wild			
		Aepyceros melampus	1	0.04%
		Aves sp.	7	0.26%
		Aves-Small	1	0.04%
		Bovid Class 1	26	0.98%
		Bovid Class 2	80	3.01%
		Bovid Class 2/3	1	0.04%
		Bovid Class 3	72	2.71%
		Bovid Class 4	1	0.04%
		Canis adustus	1	0.04%
		Canis mesomelas	2	0.08%
		Canis sp.	4	0.15%
		Carnivore Class 1	3	0.11%
		Carnivore Class 2	2	0.08%

Table 39 cont. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
2. Middle				
		Cercopithecus pygerythus	1	0.04%
		Clarias/Synodontis	1	0.04%
		Crocodilus niloticus	4	0.15%
		Equus sp.	1	0.04%
		Felis sp.	2	0.08%
		Pisces-Unidentifiable	90	3.38%
		Aves-Francolin size bird	1	0.04%
		Francolinus natalensis	1	0.04%
		Hippopotamus amphibius	332	12.48%
		Hyaena/Crocuta	1	0.04%
		Hystrix africaeaustralis	1	0.04%
		Leporid sp.	4	0.15%
		Lepus sp.	3	0.11%
		Loxodonta africana	229	8.61%
		Mammal-Very Large	7	0.26%
		Oreotragus oreotragus	3	0.11%
		Ourebia ourebi	2	0.08%
		Pedetes capensis	2	0.08%
		Phacochoerus aethiopicus	3	0.11%
		Potamochoerus porcus	1	0.04%
		Primate sp.	1	0.04%
		Procavia capensis	1	0.04%
		Raphicerus campestris	9	0.34%
		Raphicerus sp.	2	0.08%
		Redunca fulvorufula	2	0.08%
		Rodent-Large	1	0.04%
		Reptile-Unidentified	4	0.15%
		Sparadon durbanensis	1	0.04%
		Suid sp.	2	0.08%
		Sylvicapra grimmia	15	0.56%
		Syncerus caffer	2	0.08%
		Thryonomus swinderianus	2	0.08%
		Tortoise	1	0.04%
		Varanus sp.	49	1.84%
		Viveridae sp.	1	0.04%
		Viverra civetta	1	0.04%
		Rhinocerotidae sp.	1	0.04%
		Canis sp. cf. Jackal	5	0.19%
	Wild Total		**990**	**37.22%**

Table 39 cont. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
2. Middle				
	Wild?			
		Aves sp.	7	0.26%
		Aves-Medium	1	0.04%
		Bovid Class 1	75	2.82%
		Bovid Class 2	120	4.51%
		Bovid Class 2/3	1	0.04%
		Bovid Class 3	247	9.29%
		Bovid Class 4	11	0.41%
		Canis sp.	38	1.43%
		Aves-Guineafowl size bird	6	0.23%
		Mammal-Large	3	0.11%
		Mammal-Medium	1	0.04%
		Mammal-Small	3	0.11%
	Wild? Total		**513**	**19.29%**
	Mollusc			
		Achatina immaculata	6	0.23%
		Achatina sp.	28	1.05%
		Aspatharia wahlbergi	1	0.04%
		Marine Mollusc	1	0.04%
		Metachatina kraussi	12	0.45%
		Metachatina sp.	6	0.23%
		Mollusc Shell-Unidentified	44	1.65%
		Nerita sp.	1	0.04%
		Perna perna	2	0.08%
		Unio caffer	3	0.11%
		Unio/Aspatharia	10	0.38%
	Mollusc Total		**114**	**4.29%**
2. Middle Total			**1617**	**60.79%**
3. Upper				
	Mollusc			
		Unio/Aspatharia	1	0.04%
	Mollusc Total		**1**	**0.04%**
3. Upper Total			**1**	**0.04%**

Table 39 cont. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
3a. Upper				
	Wild			
		Bovid Class 1	1	0.04%
		Bovid Class 2	2	0.08%
		Bovid Class 3	2	0.08%
		Canis sp.	1	0.04%
		Pisces-Unidentifiable	3	0.11%
		Ourebia ourebi	2	0.08%
		Sylvicapra grimmia	1	0.04%
	Wild Total		**12**	**0.45%**
	Wild?			
		Bovid Class 1	8	0.30%
		Bovid Class 2	8	0.30%
		Bovid Class 3	50	1.88%
	Wild? Total		**66**	**2.48%**
	Mollusc			
		Achatina immaculata	1	0.04%
		Mollusc Shell-Unidentified	1	0.04%
		Unio/Aspatharia	1	0.04%
	Mollusc Total		**3**	**0.11%**
3a. Upper Total			**81**	**3.05%**

3b. Upper				
	Wild			
		Aves-Small	1	0.04%
		Bovid Class 1	4	0.15%
		Bovid Class 2	4	0.15%
		Bovid Class 3	4	0.15%
		Bovid Class 4	1	0.04%
		Pisces-Unidentifiable	3	0.11%
		Giraffa camelopardalis	3	0.11%
		Hippopotamus amphibius	47	1.77%
		Leporid sp.	1	0.04%
		Loxodonta africana	1	0.04%
		Suid sp.	1	0.04%
		Tortoise	1	0.04%
		Varanus sp.	6	0.23%
	Wild Total		**77**	**2.89%**

Table 39 cont. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
3b. Upper				
	Wild?			
		Canis sp.	2	0.08%
	Wild? Total		**2**	**0.08%**
	Mollusc			
		Mollusc Shell-Unidentified	8	0.30%
		Unio/Aspatharia	1	0.04%
	Mollusc Total		**9**	**0.34%**
3b. Upper Total			**88**	**3.31%**

4. Plough				
	Wild			
		Bovid Class 1	5	0.19%
		Bovid Class 2	14	0.53%
		Bovid Class 3	12	0.45%
		Bovid Class 4	2	0.08%
		Canis sp.	1	0.04%
		Carnivore Class 1	1	0.04%
		Carnivore Class 2	1	0.04%
		Clarias sp.	2	0.08%
		Felis sp.	1	0.04%
		Pisces-Unidentifiable	3	0.11%
		Hippopotamus amphibius	64	2.41%
		Mammal-Small	1	0.04%
		Mammal-Very Large	2	0.08%
		Numida meleagris	1	0.04%
		Pelea capreolus	1	0.04%
		Redunca arundinum	1	0.04%
		Reptile (snake)-Unidentified	1	0.04%
		Struthio camelus	1	0.04%
		Suid sp.	2	0.08%
		Sylvicapra grimmia	4	0.15%
		Thryonomus swinderianus	2	0.08%
		Tortoise	9	0.34%
		Tragelaphus angasi	2	0.08%
		Varanus sp.	2	0.08%
	Wild Total		**135**	**5.08%**

Table 39 cont. Frequency of wild fauna at Ndondondwane by secure horizon.

Secure Horizon	Domestication	Species	NISP	%
4. Plough Zone				
	Wild?			
		Bovid Class 1	22	0.83%
		Bovid Class 2	32	1.20%
		Bovid Class 3	123	4.62%
		Bovid Class 4	1	0.04%
		Canis sp.	1	0.04%
		Mammal-Medium	1	0.04%
	Wild? Total		**180**	**6.77%**
	Mollusc			
		Achatina immaculata	7	0.26%
		Achatina sp.	4	0.15%
		Marine Mollusc	1	0.04%
		Metachatina sp.	1	0.04%
		Unio/Aspatharia	6	0.23%
	Mollusc Total		**19**	**0.71%**
4. Plough Total			**334**	**12.56%**
Grand Total			**2660**	**100.00%**

Table 40. Frequency of wild class by secure horizon.

		1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Domestication	Class	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Wild													
	Aves	15	3.16%	10	0.67%		0.00%	1	1.27%	2	0.63%	28	1.14%
	Mammal	201	42.32%	830	55.22%	9	11.54%	66	83.54%	116	36.83%	1222	49.88%
	Pisces	29	6.11%	92	6.12%	3	3.85%	3	3.80%	5	1.59%	132	5.39%
	Reptile	6	1.26%	58	3.86%		0.00%	7	8.86%	12	3.81%	83	3.39%
Wild Total		**251**	**52.84%**	**990**	**65.87%**	**12**	**15.38%**	**77**	**97.47%**	**135**	**42.86%**	**1465**	**59.80%**
Wild?													
	Aves	2	0.42%	14	0.93%		0.00%		0.00%		0.00%	16	0.65%
	Mammal	222	46.74%	499	33.20%	66	84.62%	2	2.53%	180	57.14%	969	39.55%
Wild? Total		**224**	**47.16%**	**513**	**34.13%**	**66**	**84.62%**	**2**	**2.53%**	**180**	**57.14%**	**985**	**40.20%**
Grand Total		**475**	**100.00%**	**1503**	**100.00%**	**78**	**100.00%**	**79**	**100.00%**	**315**	**100.00%**	**2450**	**100.00%**

Table 41. Frequency of wild species by secure horizon for Dung Area.

		1. Lower		2. Middle		3a. Upper		4. Plough		Total NISP	Total %
Domestication	Species	NISP	%	NISP	%	NISP	%	NISP	%		
Wild	Aepyceros melampus	3	1.07%	1	0.21%		**0.00%**		**0.00%**	**4**	**0.41%**
	Aves sp.	2	0.71%	2	0.42%		0.00%		0.00%	4	0.41%
	Bovid Class 1	5	1.79%	7	1.46%		0.00%	2	1.11%	14	1.44%
	Bovid Class 2	24	8.57%	31	6.46%	2	6.67%	5	2.78%	62	6.39%
	Bovid Class 2/3		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
	Bovid Class 3	25	8.93%	57	11.88%	1	3.33%	9	5.00%	92	9.48%
	Bovid Class 4	4	1.43%	1	0.21%		0.00%	2	1.11%	7	0.72%
	Canis sp.	2	0.71%	3	0.63%	1	3.33%		0.00%	6	0.62%
	Carnivore Class 2		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
	Clarias/Synodontis	2	0.71%	1	0.21%		0.00%		0.00%	3	0.31%
	Crocodilus niloticus		0.00%	2	0.42%		0.00%		0.00%	2	0.21%
	Equus sp.		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
	Aves-Unidentifiable	3	1.07%	5	1.04%		0.00%		0.00%	8	0.82%
	Hippopotamus amphibius	9	3.21%	12	2.50%		0.00%	3	1.67%	24	2.47%
	Leporid sp.		0.00%	2	0.42%		0.00%		0.00%	2	0.21%
	Lepus sp.	1	0.36%	1	0.21%		0.00%		0.00%	2	0.21%
	Loxodonta africana	3	1.07%	7	1.46%		0.00%		0.00%	10	1.03%
	Mammal-Very Large	20	7.14%	1	0.21%		0.00%	2	1.11%	23	2.37%
	Ourebia ourebi	1	0.36%	2	0.42%	2	6.67%		0.00%	5	0.52%
	Pedetes capensis	1	0.36%	2	0.42%		0.00%		0.00%	3	0.31%
	Procavia capensis		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
	Sylvicapra grimmia	1	0.36%	6	1.25%	1	3.33%	1	0.56%	9	0.93%
	Syncerus caffer		0.00%	2	0.42%		0.00%		0.00%	2	0.21%
	Tortoise	1	0.36%	1	0.21%		0.00%		0.00%	2	0.21%

Table 41 cont. Frequency of wild species by secure horizon for Dung Area.

		1. Lower		2. Middle		3a. Upper		4. Plough		Total NISP	Total %
Domestication	**Species**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
	Varanus sp.		0.00%	1	0.21%		0.00%	1	0.56%	2	0.21%
	Viveridae sp.		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
	Viverra civetta		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
Wild Total		**107**	**38.21%**	**153**	**31.88%**	**7**	**23.33%**	**25**	**13.89%**	**292**	**30.10%**
Wild?	Aves sp.		**0.00%**	5	1.04%		**0.00%**		**0.00%**	**5**	**0.52%**
	Aves-Medium		0.00%	1	0.21%		0.00%		0.00%	1	0.10%
	Bovid Class 1	41	14.64%	62	12.92%	1	3.33%	22	12.22%	126	12.99%
	Bovid Class 2	67	23.93%	89	18.54%	2	6.67%	17	9.44%	175	18.04%
	Bovid Class 3	54	19.29%	159	33.13%	20	66.67%	113	62.78%	346	35.67%
	Bovid Class 4	2	0.71%	2	0.42%		0.00%	1	0.56%	5	0.52%
	Canis sp.	9	3.21%	4	0.83%		0.00%	1	0.56%	14	1.44%
	Mammal-Large		0.00%	3	0.63%		0.00%		0.00%	3	0.31%
	Mammal-Medium		0.00%		0.00%		0.00%	1	0.56%	1	0.10%
	Mammal-Small		0.00%	2	0.42%		0.00%		0.00%	2	0.21%
Wild? Total		**173**	**61.79%**	**327**	**68.13%**	**23**	**76.67%**	**155**	**86.11%**	**678**	**69.90%**
Dung Total		**280**	**100.00%**	**480**	**100.00%**	**30**	**100.00%**	**180**	**100.00%**	**970**	**100.00%**

Table 42. Frequency of wild species by secure horizon in Mound Area.

		1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Domestication	**Species**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Wild	Alopochen aegypticus	**1**	**0.65%**		**0.00%**		**0.00%**		**0.00%**	**1**	**0.08%**
	Anas undulata	1	0.65%		0.00%		0.00%		0.00%	1	0.08%
	Aves sp.	2	1.30%	3	0.34%		0.00%		0.00%	5	0.40%
	Barbus sp.	2	1.30%		0.00%		0.00%		0.00%	2	0.16%
	Aves-Large	1	0.65%		0.00%		0.00%		0.00%	1	0.08%
	Aves-Small	2	1.30%	1	0.11%	1	1.27%		0.00%	4	0.32%
	Bovid Class 1	7	4.55%	17	1.93%	4	5.06%	3	2.22%	31	2.49%
	Bovid Class 2	4	2.60%	48	5.46%	4	5.06%	9	6.67%	65	5.21%
	Bovid Class 3	7	4.55%	12	1.37%	4	5.06%	3	2.22%	26	2.09%
	Bovid Class 4	1	0.65%		0.00%	1	1.27%		0.00%	2	0.16%
	Canis adustus		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Canis mesomelas	2	1.30%	2	0.23%		0.00%		0.00%	4	0.32%
	Canis sp.		0.00%	1	0.11%		0.00%	1	0.74%	2	0.16%
	Carnivore Class 1		0.00%	3	0.34%		0.00%	1	0.74%	4	0.32%
	Carnivore Class 2		0.00%	1	0.11%		0.00%	1	0.74%	2	0.16%
	Cercopithecus pygerythus		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Clarias sp.	2	1.30%		0.00%		0.00%	2	1.48%	4	0.32%
	Crocodilus niloticus		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Felis sp.		0.00%	2	0.23%		0.00%	1	0.74%	3	0.24%
	Pisces-Unidentifiable	20	12.99%	83	9.44%	3	3.80%	3	2.22%	109	8.74%
	Aves-Francolin size bird		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Francolinus natalensis		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Francolinus swainsonii	1	0.65%		0.00%		0.00%		0.00%	1	0.08%

Table 42 cont. Frequency of wild species by secure horizon in Mound Area.

		1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Domestication	Species	NISP	%	NISP	%	NISP	%	NISP	%		
	Giraffa camelopardalis		0.00%		0.00%	3	3.80%		0.00%	3	0.24%
	Aves-Guineafowl size bird	1	0.65%		0.00%		0.00%		0.00%	1	0.08%
	Hippopotamus amphibius	65	42.21%	318	36.18%	47	59.49%	61	45.19%	491	39.37%
	Hyaena/Crocuta		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Hystrix africaeaustralis		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Leporid sp.	2	1.30%	1	0.11%	1	1.27%		0.00%	4	0.32%
	Lepus sp.		0.00%	2	0.23%		0.00%		0.00%	2	0.16%
	Loxodonta africana		0.00%	222	25.26%	1	1.27%		0.00%	223	17.88%
	Mammal-Small		0.00%		0.00%		0.00%	1	0.74%	1	0.08%
	Mammal-Very Large		0.00%	5	0.57%		0.00%		0.00%	5	0.40%
	Numida meleagris	1	0.65%		0.00%		0.00%	1	0.74%	2	0.16%
	Oreotragus oreotragus		0.00%	3	0.34%		0.00%		0.00%	3	0.24%
	Pelea capreolus		0.00%		0.00%		0.00%	1	0.74%	1	0.08%
	Phacochoerus aethiopicus		0.00%	2	0.23%		0.00%		0.00%	2	0.16%
	Philantomba monticola	1	0.65%		0.00%		0.00%		0.00%	1	0.08%
	Potamochoerus porcus	1	0.65%	1	0.11%		0.00%		0.00%	2	0.16%
	Primate sp.		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Raphicerus campestris		0.00%	9	1.02%		0.00%		0.00%	9	0.72%
	Raphicerus sp.		0.00%	2	0.23%		0.00%		0.00%	2	0.16%

Table 42 cont. Frequency of wild species by secure horizon in Mound Area.

		1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Domestication	Species	NISP	%	NISP	%	NISP	%	NISP	%		
	Redunca arundinum		0.00%		0.00%		0.00%	1	0.74%	1	0.08%
	Redunca fulvorufula	1	0.65%	2	0.23%		0.00%		0.00%	3	0.24%
	Rodent-Large		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Reptile (snake)-Unidentified		0.00%	4	0.46%		0.00%	1	0.74%	5	0.40%
	Sparadon durbanensis		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Struthio camelus	1	0.65%		0.00%		0.00%	1	0.74%	2	0.16%
	Suid sp.	5	3.25%	2	0.23%	1	1.27%	2	1.48%	10	0.80%
	Sylvicapra grimmia	6	3.90%	9	1.02%		0.00%	3	2.22%	18	1.44%
	Thryonomus swinderianus		0.00%	2	0.23%		0.00%	2	1.48%	4	0.32%
	Tortoise	2	1.30%		0.00%	1	1.27%	9	6.67%	12	0.96%
	Tragelaphus angasi		0.00%		0.00%		0.00%	2	1.48%	2	0.16%
	Varanus sp.	3	1.95%	48	5.46%	6	7.59%	1	0.74%	58	4.65%
	Rhinocerotidae sp.		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
	Canis sp. cf. Jackal		0.00%	5	0.57%		0.00%		0.00%	5	0.40%
Wild Total		**142**	**92.21%**	**821**	**93.40%**	**77**	**97.47%**	**110**	**81.48%**	**1150**	**92.22%**

Table 42 cont. Frequency of wild species by secure horizon in Mound Area.

		1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Domestication	Species	NISP	%	NISP	%	NISP	%	NISP	%		
Wild?	Aves sp.	1	0.65%	1	0.11%		0.00%		0.00%	2	0.16%
	Bovid Class 1		0.00%	2	0.23%		0.00%		0.00%	2	0.16%
	Bovid Class 2		0.00%	4	0.46%		0.00%	15	11.11%	19	1.52%
	Bovid Class 3	3	1.95%	5	0.57%		0.00%	10	7.41%	18	1.44%
	Bovid Class 4	1	0.65%	5	0.57%		0.00%		0.00%	6	0.48%
	Canis sp.	6	3.90%	34	3.87%	2	2.53%		0.00%	42	3.37%
	Aves-Guineafowl size bird	1	0.65%	6	0.68%		0.00%		0.00%	7	0.56%
	Mammal-Small		0.00%	1	0.11%		0.00%		0.00%	1	0.08%
Wild? Total		12	7.79%	58	6.60%	2	2.53%	25	18.52%	97	7.78%
Mound Total		154	100.00%	879	100.00%	79	100.00%	135	100.00%	1247	100.00%

Table 43. Frequency of wild species by secure horizon in Midden 1.

		2. Middle		3a. Upper		Total NISP	Total %
Domestication	**Species**	**NISP**	**%**	**NISP**	**%**		
Wild							
	Aves sp.	1	2.38%		0.00%	1	1.14%
	Bovid Class 1	1	2.38%	1	2.17%	2	2.27%
	Bovid Class 2	1	2.38%		0.00%	1	1.14%
	Bovid Class 3	2	4.76%	1	2.17%	3	3.41%
	Fish-Unidentifiable		0.00%	3	6.52%	3	3.41%
	Hippopotamus amphibius	1	2.38%		0.00%	1	1.14%
	Leporid sp.	1	2.38%		0.00%	1	1.14%
	Mammal-Very Large	1	2.38%		0.00%	1	1.14%
	Phacochoerus aethiopicus	1	2.38%		0.00%	1	1.14%
Wild Total		**9**	**21.43%**	**5**	**10.87%**	**14**	**15.91%**
Wild?							
	Aves sp.	1	2.38%		0.00%	1	1.14%
	Bovid Class 1	7	16.67%	7	15.22%	14	15.91%
	Bovid Class 2	7	16.67%	5	10.87%	12	13.64%
	Bovid Class 3	18	42.86%	29	63.04%	47	53.41%
Wild? Total		**33**	**78.57%**	**41**	**89.13%**	**74**	**84.09%**
Midden 1 Total		**42**	**100.00%**	**46**	**100.00%**	**88**	**100.00%**

Table 44. Frequency of wild species by secure horizon in Midden 2.

Secure Horizon	Domestication	Species	NISP	%
2. Middle				
	Wild			
		Aves sp.	1	1.23%
		Bovid Class 1	1	1.23%
		Bovid Class 3	1	1.23%
	Wild Total		**3**	**3.70%**
	Wild?			
		Bovid Class 1	4	4.94%
		Bovid Class 2	11	13.58%
		Bovid Class 3	58	71.60%
		Bovid Class 4	4	4.94%
		Mammal-Medium	1	1.23%
	Wild? Total		**78**	**96.30%**
2. Middle Total			**81**	**100.00%**

Table 45. Frequency of wild species by secure horizon in Midden 3.

		2. Middle		3a. Upper		Total NISP	Total %
Domestication	Species	NISP	%	NISP	%		
Wild							
	Crocodilus niloticus	1	5.88%		0.00%	1	5.26%
	Pisces-Unidentifiable	2	11.76%		0.00%	2	10.53%
	Hippopotamus amphibius	1	5.88%		0.00%	1	5.26%
Wild Total		**4**	**23.53%**		**0.00%**	**4**	**21.05%**
Wild?							
	Bovid Class 2	5	29.41%	1	50.00%	6	31.58%
	Bovid Class 2/3	1	5.88%		0.00%	1	5.26%
	Bovid Class 3	7	41.18%	1	50.00%	8	42.11%
Wild? Total		**13**	**76.47%**	**2**	**100.00%**	**15**	**78.95%**
Midden 3 Total		**17**	**100.00%**	**2**	**100.00%**	**19**	**100.00%**

Table 46. Frequency of wild species by secure horizon in Transect 1.

Domestication	Species	1. Lower NISP	1. Lower %	2. Middle NISP	2. Middle %	Total NISP	Total %
Wild							
	Aves sp.	2	5.13%		0.00%	2	4.65%
Wild Total		**2**	**5.13%**		**0.00%**	**2**	**4.65%**
Wild?							
	Bovid Class 1	9	23.08%		0.00%	9	20.93%
	Bovid Class 2	8	20.51%	4	100.00%	12	27.91%
	Bovid Class 3	20	51.28%		0.00%	20	46.51%
Wild? Total		**37**	**94.87%**	**4**	**100.00%**	**41**	**95.35%**
Transect 1 Total		**39**	**100.00%**	**4**	**100.00%**	**43**	**100.00%**

Table 47. Frequency of wild species by secure horizon in Transect 2.

Domestication	Species	1. Lower NISP	1. Lower %	Total NISP	Total %
Wild?					
	Bovid Class 3	2	100.00%	2	100.00%
Wild? Total		**2**	**100.00%**	**2**	**100.00%**
Transect 2 Total		**2**	**100.00%**	**2**	**100.00%**

Table 48. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Dung															
	Astragalus	5	0.88%	9	0.77%		0.00%	1	2.00%		0.00%	1	0.27%	16	0.72%
	Calcaneous	4	0.71%	11	0.94%		0.00%		0.00%		0.00%	3	0.81%	18	0.81%
	Carpal	19	3.36%	16	1.36%		0.00%	1	2.00%		0.00%	6	1.63%	42	1.89%
	Cranium	22	3.89%	125	10.65%		0.00%	2	4.00%		0.00%	5	1.36%	154	6.94%
	Femur	11	1.95%	18	1.53%		0.00%	2	4.00%		0.00%	7	1.90%	38	1.71%
	Humerus	4	0.71%	15	1.28%		0.00%		0.00%		0.00%	3	0.81%	22	0.99%
	Hyoid	2	0.35%	1	0.09%		0.00%		0.00%		0.00%		0.00%	3	0.14%
	Innominate	5	0.88%	14	1.19%		0.00%		0.00%		0.00%	1	0.27%	20	0.90%
	Longbone	1	0.18%	4	0.34%		0.00%		0.00%		0.00%		0.00%	5	0.23%
	Loose tooth	10	1.77%	19	1.62%		0.00%	1	2.00%		0.00%	1	0.27%	31	1.40%
	Loose tooth-lower	29	5.13%	30	2.56%		0.00%		0.00%		0.00%	13	3.52%	72	3.25%
	Loose tooth-upper	29	5.13%	17	1.45%		0.00%		0.00%		0.00%	7	1.90%	53	2.39%
	Mandible	15	2.65%	19	1.62%		0.00%		0.00%		0.00%	6	1.63%	40	1.80%
	Mandible with teeth	14	2.48%	12	1.02%		0.00%	2	4.00%		0.00%	2	0.54%	30	1.35%
	Metacarpal	12	2.12%	24	2.04%		0.00%	1	2.00%		0.00%	3	0.81%	40	1.80%
	Metapodial	4	0.71%	9	0.77%		0.00%	1	2.00%		0.00%	3	0.81%	17	0.77%
	Metatarsal	9	1.59%	27	2.30%		0.00%		0.00%		0.00%	3	0.81%	39	1.76%
	Patella		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Phalanx	38	6.73%	56	4.77%		0.00%	3	6.00%		0.00%	13	3.52%	110	4.96%
	Radius	3	0.53%	14	1.19%		0.00%	1	2.00%		0.00%	2	0.54%	20	0.90%
	Radius, ulna		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Rib	25	4.42%	39	3.32%		0.00%	2	4.00%		0.00%	9	2.44%	75	3.38%
	Scapula	4	0.71%	9	0.77%		0.00%		0.00%		0.00%	5	1.36%	18	0.81%

Table 48 cont. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	**Element Type**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Dung	Sesmoid	4	0.71%	5	0.43%		0.00%		0.00%		0.00%		0.00%	9	0.41%
	Sternum		0.00%	1	0.09%		0.00%		0.00%		0.00%	1	0.27%	2	0.09%
	Tarsal	9	1.59%	9	0.77%		0.00%		0.00%		0.00%	5	1.36%	23	1.04%
	Tibia	16	2.83%	19	1.62%		0.00%	1	2.00%		0.00%	6	1.63%	42	1.89%
	Ulna	6	1.06%	10	0.85%		0.00%		0.00%		0.00%	3	0.81%	19	0.86%
	Vertebra	45	7.96%	48	4.09%		0.00%	3	6.00%		0.00%	5	1.36%	101	4.55%
Dung Total		**345**	**61.06%**	**585**	**49.83%**		**0.00%**	**21**	**42.00%**		**0.00%**	**113**	**30.62%**	**1064**	**47.97%**
Midden 1															
	Astragalus		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Carpal		0.00%	5	0.43%		0.00%	3	6.00%		0.00%		0.00%	8	0.36%
	Carpal/tarsal		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Cranium		0.00%	5	0.43%		0.00%	1	2.00%		0.00%		0.00%	6	0.27%
	Femur		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Humerus		0.00%	2	0.17%		0.00%	3	6.00%		0.00%		0.00%	5	0.23%
	Innominate		0.00%		0.00%		0.00%	1	2.00%		0.00%		0.00%	1	0.05%
	Loose tooth-lower		0.00%	7	0.60%		0.00%	3	6.00%		0.00%		0.00%	10	0.45%
	Loose tooth-upper		0.00%	2	0.17%		0.00%	1	2.00%		0.00%		0.00%	3	0.14%
	Mandible		0.00%		0.00%		0.00%	2	4.00%		0.00%		0.00%	2	0.09%
	Metatarsal		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Phalanx		0.00%	4	0.34%		0.00%	2	4.00%		0.00%		0.00%	6	0.27%
	Radius		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Radius, ulna		0.00%		0.00%		0.00%	1	2.00%		0.00%		0.00%	1	0.05%

Table 48 cont. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	**Element Type**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Midden 1	Rib		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Scapula		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Sesmoid		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Tarsal		0.00%	3	0.26%		0.00%	2	4.00%		0.00%		0.00%	5	0.23%
	Tibia		0.00%		0.00%		0.00%	2	4.00%		0.00%		0.00%	2	0.09%
	Ulna		0.00%		0.00%		0.00%	1	2.00%		0.00%		0.00%	1	0.05%
	Vertebra		0.00%	13	1.11%		0.00%	3	6.00%		0.00%		0.00%	16	0.72%
Midden 1 Total			**0.00%**	**52**	**4.43%**		**0.00%**	**25**	**50.00%**		**0.00%**		**0.00%**	**77**	**3.47%**
Midden 2															
	Astragalus		0.00%	6	0.51%		0.00%		0.00%		0.00%		0.00%	6	0.27%
	Calcaneous		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Carpal		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Cranium		0.00%	7	0.60%		0.00%		0.00%		0.00%		0.00%	7	0.32%
	Femur		0.00%	3	0.26%		0.00%		0.00%		0.00%		0.00%	3	0.14%
	Humerus		0.00%	6	0.51%		0.00%		0.00%		0.00%		0.00%	6	0.27%
	Innominate		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Loose tooth-lower		0.00%	7	0.60%		0.00%		0.00%		0.00%		0.00%	7	0.32%
	Loose tooth-upper		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Mandible		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Mandible with teeth		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Metacarpal		0.00%	3	0.26%		0.00%		0.00%		0.00%		0.00%	3	0.14%
	Metapodial		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Metatarsal		0.00%	3	0.26%		0.00%		0.00%		0.00%		0.00%	3	0.14%

Table 48 cont. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	**Element Type**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
	Patella		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Phalanx		0.00%	7	0.60%		0.00%		0.00%		0.00%		0.00%	7	0.32%
	Radius		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Rib		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Scapula		0.00%	9	0.77%		0.00%		0.00%		0.00%		0.00%	9	0.41%
	Tarsal		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Tibia		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Ulna		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Vertebra		0.00%	5	0.43%		0.00%		0.00%		0.00%		0.00%	5	0.23%
Midden 2 Total			**0.00%**	**87**	**7.41%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**87**	**3.92%**
Midden 3															
	Astragalus		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Calcaneous		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Carpal		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Cranium		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Humerus		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Loose tooth		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Loose tooth-lower		0.00%	3	0.26%		0.00%	1	2.00%		0.00%		0.00%	4	0.18%
	Loose tooth-upper		0.00%	4	0.34%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Metapodial		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Phalanx		0.00%	5	0.43%		0.00%	2	4.00%		0.00%		0.00%	7	0.32%
	Radius		0.00%		0.00%		0.00%	1	2.00%		0.00%		0.00%	1	0.05%

Table 48 cont. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
	Rib		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Tarsal		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Vertebra		0.00%	2	0.17%		0.00%		0.00%		0.00%		0.00%	2	0.09%
Midden 3 Total			**0.00%**	**29**	**2.47%**		**0.00%**	**4**	**8.00%**		**0.00%**		**0.00%**	**33**	**1.49%**
Mound															
	Astragalus	1	0.18%	4	0.34%		0.00%		0.00%	1	1.69%	12	3.25%	18	0.81%
	Calcaneous	6	1.06%	12	1.02%		0.00%		0.00%		0.00%	8	2.17%	26	1.17%
	Carpal	7	1.24%	26	2.21%		0.00%		0.00%	2	3.39%	10	2.71%	45	2.03%
	Cranium	8	1.42%	24	2.04%		0.00%		0.00%	3	5.08%	9	2.44%	44	1.98%
	Femur	6	1.06%	20	1.70%		0.00%		0.00%	3	5.08%	12	3.25%	41	1.85%
	Humerus	11	1.95%	14	1.19%		0.00%		0.00%	1	1.69%	12	3.25%	38	1.71%
	Hyoid	1	0.18%	2	0.17%		0.00%		0.00%		0.00%		0.00%	3	0.14%
	Innominate	12	2.12%	10	0.85%		0.00%		0.00%	2	3.39%	7	1.90%	31	1.40%
	Loose tooth	2	0.35%	30	2.56%		0.00%		0.00%	2	3.39%	9	2.44%	43	1.94%
	Loose tooth-lower	2	0.35%	34	2.90%		0.00%		0.00%	3	5.08%	9	2.44%	48	2.16%
	Loose tooth-upper	3	0.53%	31	2.64%		0.00%		0.00%	4	6.78%	12	3.25%	50	2.25%
	Mandible	1	0.18%	2	0.17%		0.00%		0.00%	3	5.08%	2	0.54%	8	0.36%
	Mandible with teeth	3	0.53%	3	0.26%		0.00%		0.00%	1	1.69%	1	0.27%	8	0.36%
	Metacarpal	9	1.59%	19	1.62%		0.00%		0.00%	2	3.39%	8	2.17%	38	1.71%
	Metapodial	5	0.88%	16	1.36%		0.00%		0.00%	2	3.39%	14	3.79%	37	1.67%
	Metatarsal	6	1.06%	13	1.11%		0.00%		0.00%	3	5.08%	16	4.34%	38	1.71%
	Patella	2	0.35%	5	0.43%		0.00%		0.00%	1	1.69%		0.00%	8	0.36%

Table 48 cont. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
	Phalanx	58	10.27%	66	5.62%		0.00%		0.00%	16	27.12%	63	17.07%	203	9.15%
	Radius	2	0.35%	13	1.11%		0.00%		0.00%	1	1.69%	3	0.81%	19	0.86%
	Radius, ulna	2	0.35%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Rib	6	1.06%	1	0.09%		0.00%		0.00%	1	1.69%		0.00%	8	0.36%
	Scapula	3	0.53%	7	0.60%		0.00%		0.00%		0.00%	1	0.27%	11	0.50%
	Sesmoid	9	1.59%	10	0.85%		0.00%		0.00%	2	3.39%	7	1.90%	28	1.26%
	Tarsal	6	1.06%	16	1.36%		0.00%		0.00%	2	3.39%	22	5.96%	46	2.07%
	Tibia	4	0.71%	17	1.45%		0.00%		0.00%	2	3.39%	10	2.71%	33	1.49%
	Ulna	2	0.35%	9	0.77%		0.00%		0.00%	2	3.39%	6	1.63%	19	0.86%
	Vertebra	11	1.95%	7	0.60%		0.00%		0.00%		0.00%	3	0.81%	21	0.95%
Mound Total		**188**	**33.27%**	**411**	**35.01%**		**0.00%**		**0.00%**	**59**	**100.00%**	**256**	**69.38%**	**914**	**41.21%**
Transect 1															
	Astragalus	1	0.18%	1	0.09%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Carpal	3	0.53%		0.00%		0.00%		0.00%		0.00%		0.00%	3	0.14%
	Cranium	2	0.35%	2	0.17%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Femur	1	0.18%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Humerus	1	0.18%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Loose tooth-lower	1	0.18%	2	0.17%		0.00%		0.00%		0.00%		0.00%	3	0.14%
	Metacarpal		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Metapodial	1	0.18%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Metatarsal	3	0.53%	1	0.09%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Phalanx	4	0.71%	1	0.09%		0.00%		0.00%		0.00%		0.00%	5	0.23%

Table 48 cont. Bos taurus element frequency by area and secure horizon.

		1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Site Area	Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
	Radius	4	0.71%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.18%
	Radius, ulna	1	0.18%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Rib	2	0.35%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.09%
	Ulna	1	0.18%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Vertebra	2	0.35%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.09%
Transect 1 Total		**27**	**4.78%**	**8**	**0.68%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**35**	**1.58%**
Transect 2															
	Loose tooth	5	0.88%		0.00%	1	100.00%		0.00%		0.00%		0.00%	6	0.27%
	Loose tooth-upper		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
	Mandible with teeth		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
Transect 2 Total		**5**	**0.88%**	**2**	**0.17%**	**1**	**100.00%**		**0.00%**		**0.00%**		**0.00%**	**8**	**0.36%**
Bos taurus Total		**565**	**100%**	**1174**	**100%**	**1**	**100%**	**50**	**100%**	**59**	**100%**	**369**	**100%**	**2218**	**100%**

Table 49. Frequency of cattle elements by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus	16	1.41%	2	2.60%	6	6.90%	4	12.12%	22	1.81%	2	5.71%		0.00%	52	2.01%
Calcaneous	19	1.67%		0.00%	2	2.30%	2	6.06%	38	3.13%		0.00%		0.00%	61	2.35%
Carpal	45	3.96%	8	10.39%	1	1.15%	2	6.06%	58	4.77%	3	8.57%		0.00%	117	4.51%
Carpal/tarsal		0.00%	1	1.30%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
Cranium	158	13.90%	6	7.79%	7	8.05%	1	3.03%	69	5.67%	4	11.43%		0.00%	245	9.45%
Femur	40	3.52%	2	2.60%	3	3.45%		0.00%	52	4.28%	1	2.86%		0.00%	98	3.78%
Fibula		0.00%		0.00%		0.00%		0.00%	1	0.08%		0.00%		0.00%	1	0.04%
Humerus	23	2.02%	5	6.49%	6	6.90%	1	3.03%	49	4.03%	1	2.86%		0.00%	85	3.28%
Hyoid	4	0.35%		0.00%		0.00%		0.00%	5	0.41%		0.00%		0.00%	9	0.35%
Innominate	22	1.93%	1	1.30%	1	1.15%		0.00%	44	3.62%		0.00%		0.00%	68	2.62%
Longbone	6	0.53%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	6	0.23%
Loose tooth	38	3.34%		0.00%		0.00%	1	3.03%	55	4.52%		0.00%	6	75.00%	100	3.86%
Loose tooth-lower	74	6.51%	10	12.99%	7	8.05%	4	12.12%	64	5.26%	3	8.57%		0.00%	162	6.25%
Loose tooth-upper	58	5.10%	3	3.90%	4	4.60%	4	12.12%	66	5.43%		0.00%	1	12.50%	136	5.24%
Mandible	44	3.87%	2	2.60%	1	1.15%		0.00%	15	1.23%		0.00%		0.00%	62	2.39%
Mandible with teeth	31	2.73%		0.00%	2	2.30%		0.00%	11	0.90%		0.00%	1	12.50%	45	1.74%
Metacarpal	40	3.52%		0.00%	3	3.45%		0.00%	41	3.37%	1	2.86%		0.00%	85	3.28%
Metapodial	17	1.50%		0.00%	4	4.60%	1	3.03%	51	4.19%	1	2.86%		0.00%	74	2.85%
Metatarsal	44	3.87%	1	1.30%	3	3.45%		0.00%	48	3.95%	4	11.43%		0.00%	100	3.86%
Patella	4	0.35%		0.00%	1	1.15%		0.00%	9	0.74%		0.00%		0.00%	14	0.54%
Phalanx	120	10.55%	6	7.79%	7	8.05%	7	21.21%	265	21.79%	5	14.29%		0.00%	410	15.81%
Radius	23	2.02%	1	1.30%	4	4.60%	1	3.03%	27	2.22%	4	11.43%		0.00%	60	2.31%
Radius, ulna	1	0.09%	1	1.30%		0.00%		0.00%	2	0.16%	1	2.86%		0.00%	5	0.19%
Rib	84	7.39%	2	2.60%	4	4.60%	1	3.03%	10	0.82%	2	5.71%		0.00%	103	3.97%

Table 49 cont. Frequency of cattle elements by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Scapula	20	1.76%	1	1.30%	9	10.34%		0.00%	15	1.23%		0.00%		0.00%	45	1.74%
Sesmoid	9	0.79%	1	1.30%		0.00%		0.00%	40	3.29%		0.00%		0.00%	50	1.93%
Sternum	2	0.18%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.08%
Tarsal	24	2.11%	5	6.49%	4	4.60%	2	6.06%	58	4.77%		0.00%		0.00%	93	3.59%
Tibia	44	3.87%	2	2.60%	1	1.15%		0.00%	46	3.78%		0.00%		0.00%	93	3.59%
Ulna	20	1.76%	1	1.30%	2	2.30%		0.00%	23	1.89%	1	2.86%		0.00%	47	1.81%
Vertebra	107	9.41%	16	20.78%	5	5.75%	2	6.06%	32	2.63%	2	5.71%		0.00%	164	6.32%
Bos taurus Total	**1137**	**100%**	**77**	**100%**	**87**	**100%**	**33**	**100%**	**1216**	**100%**	**35**	**100%**	**8**	**100%**	**2593**	**100%**

Table 49b. Frequency of cattle element type by pan site secure horizon.

	1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus	7	1.24%	26	2.21%		0.00%	1	2.00%	1	1.69%	13	3.52%	48	2.16%
Calcaneous	10	1.77%	27	2.30%		0.00%		0.00%		0.00%	11	2.98%	48	2.16%
Carpal	29	5.13%	50	4.26%		0.00%	4	8.00%	2	3.39%	16	4.34%	101	4.55%
Carpal/tarsal		0.00%	1	0.09%		0.00%		0.00%		0.00%		0.00%	1	0.05%
Cranium	32	5.66%	164	13.97%		0.00%	3	6.00%	3	5.08%	14	3.79%	216	9.74%
Femur	18	3.19%	43	3.66%		0.00%	2	4.00%	3	5.08%	19	5.15%	85	3.83%
Humerus	16	2.83%	38	3.24%		0.00%	3	6.00%	1	1.69%	15	4.07%	73	3.29%
Hyoid	3	0.53%	3	0.26%		0.00%		0.00%		0.00%		0.00%	6	0.27%
Innominate	17	3.01%	25	2.13%		0.00%	1	2.00%	2	3.39%	8	2.17%	53	2.39%
Longbone	1	0.18%	4	0.34%		0.00%		0.00%		0.00%		0.00%	5	0.23%
Loose tooth	17	3.01%	50	4.26%	1	100.00%	1	2.00%	2	3.39%	10	2.71%	81	3.65%
Loose tooth-lower	32	5.66%	83	7.07%		0.00%	4	8.00%	3	5.08%	22	5.96%	144	6.49%
Loose tooth-upper	32	5.66%	59	5.03%		0.00%	1	2.00%	4	6.78%	19	5.15%	115	5.18%
Mandible	16	2.83%	22	1.87%		0.00%	2	4.00%	3	5.08%	8	2.17%	51	2.30%
Mandible with teeth	17	3.01%	18	1.53%		0.00%	2	4.00%	1	1.69%	3	0.81%	41	1.85%
Metacarpal	21	3.72%	47	4.00%		0.00%	1	2.00%	2	3.39%	11	2.98%	82	3.70%
Metapodial	10	1.77%	30	2.56%		0.00%	1	2.00%	2	3.39%	17	4.61%	60	2.71%
Metatarsal	18	3.19%	45	3.83%		0.00%		0.00%	3	5.08%	19	5.15%	85	3.83%
Patella	2	0.35%	10	0.85%		0.00%		0.00%	1	1.69%		0.00%	13	0.59%
Phalanx	100	17.70%	139	11.84%		0.00%	7	14.00%	16	27.12%	76	20.60%	338	15.24%
Radius	9	1.59%	32	2.73%		0.00%	2	4.00%	1	1.69%	5	1.36%	49	2.21%
Radius, ulna	3	0.53%	1	0.09%		0.00%	1	2.00%		0.00%		0.00%	5	0.23%
Rib	33	5.84%	47	4.00%		0.00%	2	4.00%	1	1.69%	9	2.44%	92	4.15%
Scapula	7	1.24%	26	2.21%		0.00%		0.00%		0.00%	6	1.63%	39	1.76%
Sesmoid	13	2.30%	16	1.36%		0.00%		0.00%	2	3.39%	7	1.90%	38	1.71%
Sternum		0.00%	1	0.09%		0.00%		0.00%		0.00%	1	0.27%	2	0.09%

Table 49b cont. Frequency of cattle element type by pan site secure horizon.

	1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Tarsal	15	2.65%	34	2.90%		0.00%	2	4.00%	2	3.39%	27	7.32%	80	3.61%
Tibia	20	3.54%	37	3.15%		0.00%	3	6.00%	2	3.39%	16	4.34%	78	3.52%
Ulna	9	1.59%	21	1.79%		0.00%	1	2.00%	2	3.39%	9	2.44%	42	1.89%
Vertebra	58	10.27%	75	6.39%		0.00%	6	12.00%		0.00%	8	2.17%	147	6.63%
Bos taurus Total	**565**	**100%**	**1174**	**100%**	**1**	**100%**	**50**	**100%**	**59**	**100%**	**369**	**100%**	**2218**	**100%**

Table 50. Frequency of sheep elements by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Astragalus	12	3.02%	2	3.39%	2	8.00%		0.00%	42	4.04%		0.00%	58	3.79%
Calcaneous	29	7.30%	1	1.69%	3	12.00%		0.00%	54	5.19%		0.00%	87	5.69%
Carpal	2	0.50%		0.00%		0.00%		0.00%	16	1.54%		0.00%	18	1.18%
Cranium	32	8.06%	2	3.39%	2	8.00%		0.00%	70	6.73%		0.00%	106	6.93%
Femur	27	6.80%	1	1.69%	5	20.00%		0.00%	52	5.00%		0.00%	85	5.56%
Humerus	19	4.79%	2	3.39%	1	4.00%		0.00%	51	4.90%	1	20.00%	74	4.84%
Innominate	42	10.58%	3	5.08%	1	4.00%		0.00%	64	6.15%	1	20.00%	111	7.26%
Loose tooth-lower	6	1.51%		0.00%		0.00%		0.00%	3	0.29%	1	20.00%	10	0.65%
Loose tooth-upper	4	1.01%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.26%
Mandible	7	1.76%	1	1.69%		0.00%		0.00%		0.00%		0.00%	8	0.52%
Mandible with teeth	31	7.81%		0.00%		0.00%	1	33.33%	41	3.94%		0.00%	73	4.77%
Metacarpal	5	1.26%	2	3.39%		0.00%		0.00%	63	6.06%		0.00%	70	4.58%
Metapodial	14	3.53%	2	3.39%		0.00%		0.00%	22	2.12%		0.00%	38	2.49%
Metatarsal	7	1.76%	3	5.08%		0.00%		0.00%	48	4.62%		0.00%	58	3.79%
Patella	2	0.50%		0.00%	1	4.00%		0.00%	8	0.77%		0.00%	11	0.72%
Phalanx	18	4.53%	19	32.20%	1	4.00%		0.00%	187	17.98%		0.00%	225	14.72%
Radius	23	5.79%	4	6.78%	2	8.00%		0.00%	101	9.71%		0.00%	130	8.50%
Radius, ulna	2	0.50%	3	5.08%		0.00%		0.00%	5	0.48%		0.00%	10	0.65%
Rib	4	1.01%		0.00%		0.00%	1	33.33%		0.00%		0.00%	5	0.33%
Scapula	56	14.11%	6	10.17%	4	16.00%	1	33.33%	88	8.46%	1	20.00%	156	10.20%
Sesmoid		0.00%	4	6.78%		0.00%		0.00%		0.00%		0.00%	4	0.26%
Tarsal	1	0.25%	1	1.69%		0.00%		0.00%	11	1.06%		0.00%	13	0.85%
Tibia	13	3.27%	2	3.39%	1	4.00%		0.00%	38	3.65%		0.00%	54	3.53%
Ulna	23	5.79%	1	1.69%	2	8.00%		0.00%	46	4.42%	1	20.00%	73	4.77%
Vertebra	18	4.53%		0.00%		0.00%		0.00%	30	2.88%		0.00%	48	3.14%
Ovis aries Total	**397**	**100%**	**59**	**100%**	**25**	**100%**	**3**	**100%**	**1040**	**100%**	**5**	**100%**	**1529**	**100%**

Table 51. Frequency of sheep elements by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus	16	5.41%	20	3.07%	1	2.33%	2	3.28%	9	5.66%	48	3.97%
Calcaneous	20	6.76%	38	5.84%	2	4.65%	3	4.92%	12	7.55%	75	6.20%
Carpal	1	0.34%	8	1.23%		0.00%	4	6.56%		0.00%	13	1.07%
Cranium	20	6.76%	46	7.07%	2	4.65%	6	9.84%	2	1.26%	76	6.28%
Femur	15	5.07%	35	5.38%	4	9.30%	2	3.28%	3	1.89%	59	4.88%
Humerus	17	5.74%	30	4.61%	1	2.33%		0.00%	4	2.52%	52	4.30%
Innominate	28	9.46%	46	7.07%	3	6.98%	4	6.56%	13	8.18%	94	7.77%
Loose tooth-lower	4	1.35%	4	0.61%		0.00%		0.00%	1	0.63%	9	0.74%
Loose tooth-upper	1	0.34%	2	0.31%		0.00%		0.00%	1	0.63%	4	0.33%
Mandible	2	0.68%	4	0.61%		0.00%		0.00%	1	0.63%	7	0.58%
Mandible with teeth	14	4.73%	35	5.38%	1	2.33%	1	1.64%	6	3.77%	57	4.71%
Metacarpal	12	4.05%	28	4.30%		0.00%	5	8.20%	11	6.92%	56	4.63%
Metapodial	5	1.69%	16	2.46%	2	4.65%		0.00%	4	2.52%	27	2.23%
Metatarsal	10	3.38%	19	2.92%	1	2.33%	5	8.20%	14	8.81%	49	4.05%
Patella	5	1.69%	2	0.31%		0.00%	1	1.64%	2	1.26%	10	0.83%
Phalanx	35	11.82%	92	14.13%	15	34.88%	8	13.11%	30	18.87%	180	14.88%
Radius	23	7.77%	59	9.06%	2	4.65%	8	13.11%	11	6.92%	103	8.51%
Radius, ulna	2	0.68%	6	0.92%		0.00%		0.00%		0.00%	8	0.66%
Rib		0.00%	3	0.46%	1	2.33%		0.00%		0.00%	4	0.33%
Scapula	30	10.14%	71	10.91%	3	6.98%	6	9.84%	15	9.43%	125	10.33%
Sesamoid		0.00%		0.00%	4	9.30%		0.00%		0.00%	4	0.33%

Table 51 cont. Frequency of sheep elements by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Tarsal		0.00%	7	1.08%		0.00%		0.00%	1	0.63%	8	0.66%
Tibia	11	3.72%	30	4.61%		0.00%	2	3.28%	1	0.63%	44	3.64%
Ulna	13	4.39%	32	4.92%	1	2.33%	4	6.56%	9	5.66%	59	4.88%
Vertebra	12	4.05%	18	2.76%		0.00%		0.00%	9	5.66%	39	3.22%
Ovis aries Total	**296**	**100.00%**	**651**	**100.00%**	**43**	**100.00%**	**61**	**100.00%**	**159**	**100.00%**	**1210**	**100.00%**

Table 52. Frequency of goat elements by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Capra hircus												
Astragalus	4	2.27%		0.00%		0.00%	16	4.56%		0.00%	20	3.74%
Calcaneous	9	5.11%		0.00%		0.00%	25	7.12%		0.00%	34	6.36%
Carpal		0.00%		0.00%		0.00%	8	2.28%		0.00%	8	1.50%
Cranium	20	11.36%		0.00%		0.00%	10	2.85%		0.00%	30	5.61%
Femur	9	5.11%		0.00%		0.00%	7	1.99%		0.00%	16	2.99%
Humerus	10	5.68%		0.00%		0.00%	13	3.70%		0.00%	23	4.30%
Innominate	9	5.11%		0.00%		0.00%	33	9.40%		0.00%	42	7.85%
Longbone		0.00%		0.00%		0.00%	1	0.28%		0.00%	1	0.19%
Loose tooth	1	0.57%		0.00%		0.00%		0.00%		0.00%	1	0.19%
Loose tooth-lower	1	0.57%		0.00%		0.00%	1	0.28%		0.00%	2	0.37%
Loose tooth-upper	10	5.68%		0.00%		0.00%		0.00%		0.00%	10	1.87%
Mandible	6	3.41%		0.00%		0.00%	1	0.28%		0.00%	7	1.31%
Mandible with teeth	7	3.98%		0.00%		0.00%	4	1.14%		0.00%	11	2.06%
Metacarpal	4	2.27%	1	16.67%		0.00%	21	5.98%		0.00%	26	4.86%
Metapodial	1	0.57%		0.00%		0.00%	11	3.13%		0.00%	12	2.24%
Metatarsal	6	3.41%		0.00%		0.00%	14	3.99%		0.00%	20	3.74%
Phalanx	25	14.20%	3	50.00%		0.00%	82	23.36%		0.00%	110	20.56%
Radius	11	6.25%	1	16.67%		0.00%	25	7.12%	1	100.00%	38	7.10%
Radius, ulna	1	0.57%		0.00%		0.00%	5	1.42%		0.00%	6	1.12%
Scapula	11	6.25%		0.00%		0.00%	34	9.69%		0.00%	45	8.41%
Tarsal		0.00%		0.00%		0.00%	5	1.42%		0.00%	5	0.93%
Tibia	7	3.98%		0.00%	1	100.00%	15	4.27%		0.00%	23	4.30%
Ulna	7	3.98%		0.00%		0.00%	7	1.99%		0.00%	14	2.62%
Vertebra	17	9.66%	1	16.67%		0.00%	10	2.85%		0.00%	28	5.23%
Capra hircus Total	**176**	**100%**	**6**	**100%**	**1**	**100%**	**348**	**99.15%**	**1**	**100%**	**532**	**99.44%**

Table 52 cont. Frequency of goat elements by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Capra hircus (dwarf)												
Mandible with teeth		0.00%		0.00%		0.00%	1	0.28%		0.00%	1	0.19%
Phalanx		0.00%		0.00%		0.00%	2	0.57%		0.00%	2	0.37%
Capra hircus (dwarf) Total		**0.00%**		**0.00%**		**0.00%**	**3**	**0.85%**		**0.00%**	**3**	**0.56%**
Grand Total	**176**	**100%**	**6**	**100%**	**1**	**100%**	**351**	**100%**	**1**	**100.00%**	**535**	**100.00%**

Table 53. Goat element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Capra hircus												
Astragalus	2	1.79%	6	2.86%		0.00%	2	7.41%	3	6.25%	13	3.23%
Calcaneous	5	4.46%	16	7.62%		0.00%		0.00%	4	8.33%	25	6.22%
Carpal		0.00%	2	0.95%		0.00%	1	3.70%		0.00%	3	0.75%
Cranium	10	8.93%	6	2.86%		0.00%	1	3.70%	3	6.25%	20	4.98%
Femur	6	5.36%	9	4.29%		0.00%		0.00%		0.00%	15	3.73%
Humerus	7	6.25%	8	3.81%		0.00%		0.00%	4	8.33%	19	4.73%
Innominate	3	2.68%	17	8.10%	1	20.00%	1	3.70%	2	4.17%	24	5.97%
Longbone		0.00%	1	0.48%		0.00%		0.00%		0.00%	1	0.25%
Loose tooth	1	0.89%		0.00%		0.00%		0.00%		0.00%	1	0.25%
Loose tooth-lower	1	0.89%		0.00%		0.00%		0.00%		0.00%	1	0.25%
Loose tooth-upper	2	1.79%	6	2.86%		0.00%		0.00%	2	4.17%	10	2.49%
Mandible	1	0.89%	4	1.90%		0.00%		0.00%	1	2.08%	6	1.49%
Mandible with teeth	6	5.36%	3	1.43%		0.00%		0.00%	1	2.08%	10	2.49%
Metacarpal		0.00%	11	5.24%	1	20.00%	1	3.70%	4	8.33%	17	4.23%
Metapodial		0.00%	6	2.86%		0.00%		0.00%	1	2.08%	7	1.74%
Metatarsal	7	6.25%	6	2.86%		0.00%	1	3.70%	2	4.17%	16	3.98%
Phalanx	24	21.43%	53	25.24%	1	20.00%	6	22.22%	8	16.67%	92	22.89%
Radius	5	4.46%	14	6.67%		0.00%	3	11.11%	4	8.33%	26	6.47%
Radius, ulna	3	2.68%	1	0.48%		0.00%	1	3.70%		0.00%	5	1.24%
Scapula	8	7.14%	18	8.57%		0.00%	3	11.11%	3	6.25%	32	7.96%
Tarsal	1	0.89%	4	1.90%		0.00%		0.00%		0.00%	5	1.24%
Tibia	4	3.57%	9	4.29%		0.00%	2	7.41%	3	6.25%	18	4.48%
Ulna	5	4.46%	3	1.43%	2	40.00%	1	3.70%		0.00%	11	2.74%
Vertebra	8	7.14%	7	3.33%		0.00%	4	14.81%	3	6.25%	22	5.47%
	109	**97.32%**	**210**	**100.00%**	**5**	**100.00%**	**27**	**100.00%**	**48**	**100.00%**	**399**	**99.25%**

Table 53 cont. Goat element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Capra hircus (dwarf)												
Mandible with teeth	1	0.89%		0.00%		0.00%		0.00%		0.00%	1	0.25%
Phalanx	2	1.79%		0.00%		0.00%		0.00%		0.00%	2	0.50%
Capra hircus (dwarf) Total	**3**	**2.68%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**3**	**0.75%**
Grand Total	**112**	**100.00%**	**210**	**100.00%**	**5**	**100.00%**	**27**	**100.00%**	**48**	**100.00%**	**402**	**100.00%**

Table 54. Sheep/Goat element frequency by area.

Element Type	Dung NISP	Dung %	Midden 1 NISP	Midden 1 %	Midden 2 NISP	Midden 2 %	Midden 3 NISP	Midden 3 %	Mound NISP	Mound %	Surface NISP	Surface %	Transect 1 NISP	Transect 1 %	Transect 2 NISP	Transect 2 %	Total NISP	Total %
Astragalus	13	0.72%	2	1.90%		0.00%	2	5.71%	21	0.93%		0.00%		0.00%		0.00%	38	0.87%
Calcaneous	17	0.94%		0.00%		0.00%		0.00%	42	1.86%		0.00%	2	5.13%		0.00%	61	1.39%
Carpal	22	1.21%	1	0.95%		0.00%		0.00%	68	3.00%		0.00%		0.00%		0.00%	91	2.07%
Carpal/tarsal		0.00%		0.00%		0.00%		0.00%	3	0.13%		0.00%		0.00%		0.00%	3	0.07%
Cranium	222	12.21%	9	8.57%	6	5.31%	1	2.86%	135	5.97%		0.00%	2	5.13%		0.00%	375	8.55%
Femur	46	2.53%	4	3.81%	2	1.77%	1	2.86%	140	6.19%		0.00%	1	2.56%		0.00%	194	4.42%
Flatbone	4	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.09%
Humerus	86	4.73%	7	6.67%	3	2.65%	1	2.86%	108	4.77%	1	100%	5	12.82%		0.00%	211	4.81%
Hyoid	3	0.17%		0.00%		0.00%		0.00%	12	0.53%		0.00%		0.00%		0.00%	15	0.34%
Innominate	79	4.35%	3	2.86%	3	2.65%		0.00%	96	4.24%		0.00%		0.00%		0.00%	181	4.13%
Longbone	3	0.17%	2	1.90%		0.00%		0.00%	4	0.18%		0.00%		0.00%		0.00%	9	0.21%
Loose tooth	82	4.51%	1	0.95%	26	23.01%	2	5.71%	477	21.08%		0.00%	2	5.13%		0.00%	590	13.45%
Loose tooth-lower	94	5.17%	13	12.38%	4	3.54%	6	17.14%	142	6.27%		0.00%	3	7.69%	5	41.67%	267	6.09%
Loose tooth-upper	86	4.73%	2	1.90%	5	4.42%	4	11.43%	92	4.07%		0.00%	3	7.69%	1	8.33%	193	4.40%
Mandible	72	3.96%	4	3.81%	3	2.65%	1	2.86%	35	1.55%		0.00%	3	7.69%		0.00%	118	2.69%
Mandible with teeth	43	2.37%	3	2.86%	5	4.42%	2	5.71%	38	1.68%		0.00%	2	5.13%		0.00%	93	2.12%
Metacarpal	24	1.32%	4	3.81%	3	2.65%		0.00%	99	4.37%		0.00%		0.00%		0.00%	130	2.96%
Metapodial	15	0.83%	4	3.81%	2	1.77%	2	5.71%	48	2.12%		0.00%	1	2.56%		0.00%	72	1.64%
Metatarsal	63	3.47%	5	4.76%	1	0.88%		0.00%	104	4.60%		0.00%		0.00%	1	8.33%	174	3.97%
Patella	5	0.28%		0.00%		0.00%		0.00%	12	0.53%		0.00%		0.00%	1	8.33%	18	0.41%
Phalanx	49	2.70%	4	3.81%	2	1.77%	3	8.57%	202	8.93%		0.00%		0.00%		0.00%	260	5.93%
Radius	59	3.25%	1	0.95%	4	3.54%	1	2.86%	84	3.71%		0.00%	1	2.56%		0.00%	150	3.42%

Table 54 cont. Sheep/Goat element frequency by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Surface		Transect 1		Transect 2		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Radius, ulna	3	0.17%		0.00%		0.00%		0.00%	2	0.09%		0.00%		0.00%	5	0.11%		
Rib	295	16.23%	13	12.38%	29	25.66 %	4	11.43 %	4	0.18%		0.00%	6	15.38%	2	16.67%	353	8.05 %
Scapula	39	2.15%	3	2.86%	5	4.42%		0.00%	46	2.03%		0.00%		0.00%		0.00%	93	2.12 %
Sesmoid		0.00%		0.00%		0.00%		0.00%	12	0.53%		0.00%		0.00%		0.00%	12	0.27 %
Sternum	1	0.06%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.02 %
Tarsal	24	1.32%	3	2.86%		0.00%	2	5.71%	41	1.81%		0.00%		0.00%	1	8.33%	71	1.62 %
Tibia	65	3.58%	2	1.90%	4	3.54%		0.00%	122	5.39%		0.00%	2	5.13%		0.00%	195	4.45 %
Ulna	30	1.65%	4	3.81%	2	1.77%	3	8.57%	34	1.50%		0.00%		0.00%	1	8.33%	74	1.69 %
Vertebra	274	15.07%	11	10.48%	4	3.54%		0.00%	40	1.77%		0.00%	6	15.38%		0.00%	335	7.64 %
Grand Total	**1818**	**100%**	**105**	**100%**	**113**	**100%**	**35**	**100%**	**2263**	**100%**	**1**	**100%**	**39**	**100%**	**12**	**100%**	**4386**	**100%**

Table 55. Sheep/Goat element frequency by secure horizon.

Element Type	1. Lower NISP	1. Lower %	2. Middle NISP	2. Middle %	3a. Upper NISP	3a. Upper %	3b. Upper NISP	3b. Upper %	4. Plough NISP	4. Plough %	5. Surface NISP	5. Surface %	Total NISP	Total %
Astragalus	7	0.74%	15	0.81%	1	1.09%	3	3.23%	9	1.54%		0.00%	35	0.98%
Calcaneous	19	2.00%	22	1.19%	2	2.17%		0.00%	9	1.54%		0.00%	52	1.46%
Carpal	21	2.21%	36	1.95%		0.00%		0.00%	14	2.40%		0.00%	71	1.99%
Cranium	97	10.21%	169	9.17%	15	16.30%	5	5.38%	21	3.60%		0.00%	307	8.62%
Femur	49	5.16%	63	3.42%	1	1.09%	5	5.38%	31	5.32%		0.00%	149	4.18%
Flatbone		0.00%	4	0.22%		0.00%		0.00%		0.00%		0.00%	4	0.11%
Humerus	56	5.89%	80	4.34%	3	3.26%	3	3.23%	33	5.66%	1	100%	176	4.94%
Hyoid		0.00%	8	0.43%		0.00%		0.00%		0.00%		0.00%	8	0.22%
Innominate	45	4.74%	68	3.69%	1	1.09%	1	1.08%	55	9.43%		0.00%	170	4.77%
Longbone		0.00%	3	0.16%	1	1.09%		0.00%		0.00%		0.00%	4	0.11%
Loose tooth	63	6.63%	236	12.81%	3	3.26%	16	17.20%	90	15.44%		0.00%	408	11.45%
Loose tooth-lower	40	4.21%	113	6.13%	10	10.87%	15	16.13%	24	4.12%		0.00%	202	5.67%
Loose tooth-upper	29	3.05%	94	5.10%	2	2.17%		0.00%	18	3.09%		0.00%	143	4.01%
Mandible	35	3.68%	49	2.66%	1	1.09%	2	2.15%	14	2.40%		0.00%	101	2.84%
Mandible with teeth	21	2.21%	45	2.44%		0.00%	1	1.08%	8	1.37%		0.00%	75	2.11%
Metacarpal	27	2.84%	39	2.12%	3	3.26%	5	5.38%	31	5.32%		0.00%	105	2.95%
Metapodial	13	1.37%	27	1.47%	1	1.09%	2	2.15%	12	2.06%		0.00%	55	1.54%
Metatarsal	36	3.79%	73	3.96%	5	5.43%	9	9.68%	23	3.95%		0.00%	146	4.10%
Patella	4	0.42%	8	0.43%		0.00%		0.00%		0.00%		0.00%	12	0.34%
Phalanx	55	5.79%	92	4.99%	3	3.26%	12	12.90%	40	6.86%		0.00%	202	5.67%
Radius	39	4.11%	64	3.47%		0.00%	1	1.08%	22	3.77%		0.00%	126	3.54%
Radius, ulna		0.00%	2	0.11%		0.00%		0.00%	2	0.34%		0.00%	4	0.11%
Rib	78	8.21%	198	10.74%	19	20.65%		0.00%	40	6.86%		0.00%	335	9.40%
Scapula	24	2.53%	31	1.68%	5	5.43%	3	3.23%	17	2.92%		0.00%	80	2.25%

Table 55 cont. Sheep/Goat element frequency by secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		5. Surface		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Sesamoid	2	0.21%	4	0.22%		0.00%		0.00%	3	0.51%		0.00%	9	0.25%
Sternum		0.00%	1	0.05%		0.00%		0.00%		0.00%		0.00%	1	0.03%
Tarsal	19	2.00%	29	1.57%	3	3.26%	3	3.23%	9	1.54%		0.00%	63	1.77%
Tibia	50	5.26%	77	4.18%	3	3.26%	5	5.38%	29	4.97%		0.00%	164	4.60%
Ulna	18	1.89%	29	1.57%		0.00%		0.00%	11	1.89%		0.00%	58	1.63%
Vertebra	103	10.84%	164	8.90%	10	10.87%	2	2.15%	18	3.09%		0.00%	297	8.34%
Ovis/Capra Total	**950**	**100%**	**1843**	**100%**	**92**	**100%**	**93**	**100%**	**583**	**100%**	**1**	**100%**	**3562**	**100%**

Table 56. Domestic dog element frequency by area.

	Dung		Mound		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**		
Astragalus	1	2.86%	1	1.37%	2	1.85%
Calcaneous	1	2.86%	4	5.48%	5	4.63%
Cranium		0.00%	7	9.59%	7	6.48%
Fibula		0.00%	1	1.37%	1	0.93%
Humerus	1	2.86%	6	8.22%	7	6.48%
Innominate	1	2.86%	4	5.48%	5	4.63%
Loose tooth	4	11.43%	1	1.37%	5	4.63%
Loose tooth-lower	2	5.71%	1	1.37%	3	2.78%
Loose tooth-upper		0.00%	3	4.11%	3	2.78%
Mandible	3	8.57%	2	2.74%	5	4.63%
Mandible with teeth	2	5.71%	4	5.48%	6	5.56%
Metacarpal	2	5.71%	8	10.96%	10	9.26%
Metapodial		0.00%	2	2.74%	2	1.85%
Metatarsal	1	2.86%	6	8.22%	7	6.48%
Phalanx	1	2.86%	6	8.22%	7	6.48%
Radius	2	5.71%	5	6.85%	7	6.48%
Rib	3	8.57%	1	1.37%	4	3.70%
Scapula	2	5.71%	3	4.11%	5	4.63%
Tibia	1	2.86%	1	1.37%	2	1.85%
Ulna	1	2.86%	1	1.37%	2	1.85%
Vertebra	7	20.00%	6	8.22%	13	12.04%
Canis familiaris Total	**35**	**100.00%**	**73**	**100.00%**	**108**	**100.00%**

Table 57. Domestic dog element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus	1	2.56%	1	3.45%		0.00%		0.00%	2	2.20%
Calcaneous	2	5.13%	1	3.45%		0.00%	2	10.00%	5	5.49%
Cranium	5	12.82%	1	3.45%		0.00%		0.00%	6	6.59%
Humerus	2	5.13%	2	6.90%		0.00%	2	10.00%	6	6.59%
Innominate	1	2.56%		0.00%		0.00%	3	15.00%	4	4.40%
Loose tooth	2	5.13%	3	10.34%		0.00%		0.00%	5	5.49%
Loose tooth-lower	1	2.56%	2	6.90%		0.00%		0.00%	3	3.30%
Loose tooth-upper	1	2.56%	1	3.45%		0.00%		0.00%	2	2.20%
Mandible	1	2.56%	2	6.90%		0.00%	1	5.00%	4	4.40%
Mandible with teeth		0.00%	3	10.34%		0.00%		0.00%	3	3.30%
Metacarpal	4	10.26%	3	10.34%		0.00%	3	15.00%	10	10.99%
Metapodial		0.00%		0.00%		0.00%	2	10.00%	2	2.20%
Metatarsal	3	7.69%	1	3.45%		0.00%	1	5.00%	5	5.49%
Phalanx	2	5.13%	1	3.45%		0.00%	1	5.00%	4	4.40%
Radius	2	5.13%	2	6.90%		0.00%	2	10.00%	6	6.59%
Rib	1	2.56%	2	6.90%		0.00%	1	5.00%	4	4.40%
Scapula	3	7.69%		0.00%	1	33.33%	1	5.00%	5	5.49%
Tibia		0.00%		0.00%		0.00%	1	5.00%	1	1.10%
Ulna	1	2.56%		0.00%		0.00%		0.00%	1	1.10%
Vertebra	7	17.95%	4	13.79%	2	66.67%		0.00%	13	14.29%
Canis familiaris Total	**39**	**100.00%**	**29**	**100.00%**	**3**	**100.00%**	**20**	**100.00%**	**91**	**100.00%**

Table 58. Hippopotamus amphibius element frequency by area.

	Dung		Midden 1		Midden 3		Mound		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Astragalus	2	6.06%		0.00%		0.00%	5	0.38%	7	0.52%
Calcaneous		0.00%		0.00%		0.00%	1	0.08%	1	0.07%
Carpal	1	3.03%		0.00%		0.00%	21	1.60%	22	1.63%
Carpal/tarsal		0.00%		0.00%		0.00%	32	2.44%	32	2.37%
Cranium	1	3.03%		0.00%		0.00%	2	0.15%	3	0.22%
Femur		0.00%		0.00%		0.00%	3	0.23%	3	0.22%
Fibula		0.00%		0.00%		0.00%	1	0.08%	1	0.07%
Flatbone		0.00%		0.00%		0.00%	4	0.30%	4	0.30%
Humerus	1	3.03%		0.00%		0.00%	4	0.30%	5	0.37%
Innominate		0.00%		0.00%		0.00%	5	0.38%	5	0.37%
Longbone	2	6.06%		0.00%		0.00%	9	0.69%	11	0.82%
Loose tooth	14	42.42%	1	100.00%		0.00%	996	75.86%	1011	75.00%
Loose tooth-lower		0.00%		0.00%	1	100.00%	2	0.15%	3	0.22%
Loose tooth-upper		0.00%		0.00%		0.00%	3	0.23%	3	0.22%
Mandible		0.00%		0.00%		0.00%	2	0.15%	2	0.15%
Metacarpal		0.00%		0.00%		0.00%	19	1.45%	19	1.41%
Metapodial		0.00%		0.00%		0.00%	29	2.21%	29	2.15%
Metatarsal		0.00%		0.00%		0.00%	23	1.75%	23	1.71%
Multiple elements		0.00%		0.00%		0.00%	33	2.51%	33	2.45%

Table 58. *Hippopotamus amphibius* element frequency by area.

	Dung		Midden 1		Midden 3		Mound		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Phalanx	6	18.18%		0.00%		0.00%	61	4.65%	67	4.97%
Rib		0.00%		0.00%		0.00%	10	0.76%	10	0.74%
Scapula		0.00%		0.00%		0.00%	1	0.08%	1	0.07%
Sesmoid		0.00%		0.00%		0.00%	13	0.99%	13	0.96%
Tarsal		0.00%		0.00%		0.00%	10	0.76%	10	0.74%
Tibia		0.00%		0.00%		0.00%	8	0.61%	8	0.59%
Ulna		0.00%		0.00%		0.00%	1	0.08%	1	0.07%
Unidentifiable	6	18.18%		0.00%		0.00%	7	0.53%	13	0.96%
Vertebra		0.00%		0.00%		0.00%	8	0.61%	8	0.59%
Hippopotamus amphibius Total	**33**	**100.00%**	**1**	**100.00%**	**1**	**100.00%**	**1313**	**100.00%**	**1348**	**100.00%**

Table 59. *Hippopotamus amphibius* element frequency by pan site secure horizon.

	1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Astragalus	1	1.35%	4	1.20%		0.00%	1	1.56%	6	1.16%
Carpal	2	2.70%	4	1.20%	1	2.13%	7	10.94%	14	2.71%
Carpal/tarsal		0.00%		0.00%	6	12.77%	20	31.25%	26	5.03%
Cranium	1	1.35%	1	0.30%		0.00%		0.00%	2	0.39%
Femur	3	4.05%		0.00%		0.00%		0.00%	3	0.58%
Fibula		0.00%	1	0.30%		0.00%		0.00%	1	0.19%
Humerus	2	2.70%	1	0.30%		0.00%	1	1.56%	4	0.77%
Innominate	3	4.05%	1	0.30%		0.00%		0.00%	4	0.77%
Longbone	1	1.35%	3	0.90%		0.00%	1	1.56%	5	0.97%
Loose tooth	34	45.95%	234	70.48%	37	78.72%	13	20.31%	318	61.51%
Loose tooth-lower		0.00%	2	0.60%		0.00%		0.00%	2	0.39%
Loose tooth-upper		0.00%	2	0.60%		0.00%		0.00%	2	0.39%
Mandible	1	1.35%	1	0.30%		0.00%		0.00%	2	0.39%
Metacarpal		0.00%	2	0.60%		0.00%		0.00%	2	0.39%
Metapodial	2	2.70%	5	1.51%	1	2.13%	6	9.38%	14	2.71%
Metatarsal	2	2.70%	7	2.11%		0.00%		0.00%	9	1.74%
Multiple elements	4	5.41%	29	8.73%		0.00%		0.00%	33	6.38%
Phalanx	5	6.76%	18	5.42%	2	4.26%	3	4.69%	28	5.42%
Rib	1	1.35%	3	0.90%		0.00%		0.00%	4	0.77%
Sesmoid	2	2.70%	3	0.90%		0.00%	4	6.25%	9	1.74%
Tarsal	2	2.70%	2	0.60%		0.00%	1	1.56%	5	0.97%
Tibia	2	2.70%	4	1.20%		0.00%	1	1.56%	7	1.35%
Ulna	1	1.35%		0.00%		0.00%		0.00%	1	0.19%
Unidentifiable	1	1.35%	5	1.51%		0.00%	6	9.38%	12	2.32%
Vertebra	4	5.41%		0.00%		0.00%		0.00%	4	0.77%
Hippopotamus amphibius Total	**74**	**100.00%**	**332**	**100.00%**	**47**	**100.00%**	**64**	**100.00%**	**517**	**100.00%**

Table 60. Elephant element frequency by area.

	Dung		Mound		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**		
Loose tooth	10	100.00%	549	99.82%	559	99.82%
Rib		0.00%	1	0.18%	1	0.18%
Grand Total	**10**	**100.00%**	**550**	**100.00%**	**560**	**100.00%**

Table 61. Elephant element frequency by pan site secure horizon.

		1. Lower		2. Middle		3b. Upper		Total NISP	Total %
Species	**Element Type**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
	Loose tooth	3	100.00%	229	100.00%		0.00%	232	99.57%
	Rib		0.00%		0.00%	1	100.00%	1	0.43%
Loxodonta africana Total		**3**	**100.00%**	**229**	**100.00%**	**1**	**100.00%**	**233**	**100.00%**

Table 62. Common duiker element frequency by area.

	Dung		Mound		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**		
Astragalus	1	8.33%	2	8.00%	3	8.11%
Calcaneous		0.00%	2	8.00%	2	5.41%
Cranium	2	16.67%		0.00%	2	5.41%
Femur	1	8.33%	3	12.00%	4	10.81%
Hyoid		0.00%	1	4.00%	1	2.70%
Innominate		0.00%	2	8.00%	2	5.41%
Loose tooth-lower		0.00%	1	4.00%	1	2.70%
Mandible	1	8.33%		0.00%	1	2.70%
Mandible with teeth	1	8.33%	2	8.00%	3	8.11%
Metacarpal	2	16.67%		0.00%	2	5.41%
Metatarsal		0.00%	3	12.00%	3	8.11%
Phalanx	1	8.33%	2	8.00%	3	8.11%
Radius		0.00%	1	4.00%	1	2.70%
Scapula	2	16.67%	4	16.00%	6	16.22%
Tibia	1	8.33%		0.00%	1	2.70%
Ulna		0.00%	2	8.00%	2	5.41%
Sylvicapra grimmia Total	**12**	**100.00%**	**25**	**100.00%**	**37**	**100.00%**

Table 63. Common duiker element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus		0.00%	2	13.33%		0.00%		0.00%	2	7.41%
Calcaneous		0.00%	2	13.33%		0.00%		0.00%	2	7.41%
Cranium		0.00%	2	13.33%		0.00%		0.00%	2	7.41%
Femur	1	14.29%		0.00%		0.00%	1	25.00%	2	7.41%
Hyoid	1	14.29%		0.00%		0.00%		0.00%	1	3.70%
Innominate		0.00%	1	6.67%		0.00%		0.00%	1	3.70%
Loose tooth-lower		0.00%	1	6.67%		0.00%		0.00%	1	3.70%
Mandible		0.00%	1	6.67%		0.00%		0.00%	1	3.70%
Mandible with teeth	1	14.29%		0.00%		0.00%		0.00%	1	3.70%
Metacarpal		0.00%	1	6.67%		0.00%	1	25.00%	2	7.41%
Metatarsal	1	14.29%	2	13.33%		0.00%		0.00%	3	11.11%
Phalanx		0.00%		0.00%		0.00%	1	25.00%	1	3.70%
Radius	1	14.29%		0.00%		0.00%		0.00%	1	3.70%
Scapula	1	14.29%	3	20.00%		0.00%		0.00%	4	14.81%
Tibia		0.00%		0.00%	1	100.00 %		0.00%	1	3.70%
Ulna	1	14.29%		0.00%		0.00%	1	25.00%	2	7.41%
Sylvicapra grimmia Total	**7**	**100%**	**15**	**100%**	**1**	**100%**	**4**	**100%**	**27**	**100%**

Table 64. Bovid Class 1 element frequency by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Transect 2		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus	1	0.36%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.25%
Calcaneous	4	1.43%	1	4.76%		0.00%		0.00%		0.00%		0.00%	5	1.26%
Carpal		0.00%		0.00%		0.00%	2	3.17%		0.00%		0.00%	2	0.50%
Cranium	44	15.71%		0.00%		0.00%	2	3.17%	1	7.14%	1	14.29%	48	12.09%
Femur	10	3.57%		0.00%	1	8.33%	4	6.35%		0.00%		0.00%	15	3.78%
Humerus	10	3.57%	2	9.52%		0.00%	5	7.94%	1	7.14%		0.00%	18	4.53%
Hyoid		0.00%		0.00%		0.00%	2	3.17%		0.00%		0.00%	2	0.50%
Innominate	6	2.14%	1	4.76%		0.00%		0.00%		0.00%		0.00%	7	1.76%
Loose tooth	13	4.64%		0.00%		0.00%	1	1.59%		0.00%		0.00%	14	3.53%
Loose tooth-lower	2	0.71%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.50%
Loose tooth-upper	2	0.71%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.50%
Mandible	15	5.36%	1	4.76%		0.00%	4	6.35%		0.00%		0.00%	20	5.04%
Mandible with teeth	2	0.71%		0.00%		0.00%	2	3.17%		0.00%		0.00%	4	1.01%
Metacarpal	6	2.14%	1	4.76%		0.00%	3	4.76%		0.00%		0.00%	10	2.52%
Metapodial	7	2.50%		0.00%		0.00%	2	3.17%		0.00%		0.00%	9	2.27%
Metatarsal	4	1.43%	2	9.52%		0.00%	5	7.94%		0.00%		0.00%	11	2.77%
Phalanx	5	1.79%	2	9.52%	2	16.67%	8	12.70%		0.00%		0.00%	17	4.28%
Radius	3	1.07%	2	9.52%		0.00%	5	7.94%	1	7.14%		0.00%	11	2.77%
Rib	42	15.00%	2	9.52%	7	58.33%		0.00%	4	28.57%	2	28.57%	57	14.36%
Scapula	12	4.29%	3	14.29%	1	8.33%	6	9.52%		0.00%	1	14.29%	23	5.79%

Table 64 cont. Bovid Class 1 element frequency by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Transect 2		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Tarsal	3	1.07%	2	9.52%		0.00%	1	1.59%		0.00%		0.00%	6	1.51%
Tibia	5	1.79%	1	4.76%		0.00%	5	7.94%	2	14.29%		0.00%	13	3.27%
Ulna	5	1.79%		0.00%		0.00%	3	4.76%	1	7.14%		0.00%	9	2.27%
Unidentifiable	2	0.71%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.50%
Vertebra	71	25.36%	1	4.76%	1	8.33%	3	4.76%	4	28.57%	3	42.86%	83	20.91%
Bovid Class 1 Total	**280**	**100%**	**21**	**100%**	**12**	**100%**	**63**	**100%**	**14**	**100%**	**7**	**100%**	**397**	**100%**

Table 65. Bovid Class 1 element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus		0.00%	1	0.49%		0.00%		0.00%		0.00%	1	0.26%
Calcaneous	1	1.09%	4	1.95%		0.00%		0.00%		0.00%	5	1.31%
Carpal		0.00%	2	0.98%		0.00%		0.00%		0.00%	2	0.52%
Cranium	7	7.61%	27	13.17%		0.00%		0.00%	14	22.22%	48	12.57%
Femur	1	1.09%	8	3.90%		0.00%	1	25.00%	4	6.35%	14	3.66%
Humerus	3	3.26%	3	1.46%	2	11.11%	1	25.00%	7	11.11%	16	4.19%
Hyoid	1	1.09%		0.00%		0.00%		0.00%		0.00%	1	0.26%
Innominate	2	2.17%	2	0.98%	1	5.56%		0.00%	1	1.59%	6	1.57%
Long bone		0.00%	2	0.98%		0.00%		0.00%	2	3.17%	4	1.05%
Loose tooth	4	4.35%	10	4.88%		0.00%		0.00%		0.00%	14	3.66%
Loose tooth-lower	1	1.09%	1	0.49%		0.00%		0.00%		0.00%	2	0.52%
Loose tooth-upper		0.00%	1	0.49%		0.00%		0.00%	1	1.59%	2	0.52%
Mandible	5	5.43%	11	5.37%		0.00%	2	50.00%	2	3.17%	20	5.24%
Mandible with teeth	2	2.17%		0.00%		0.00%		0.00%	2	3.17%	4	1.05%
Metacarpal	5	5.43%	3	1.46%	1	5.56%		0.00%	1	1.59%	10	2.62%
Metapodial	2	2.17%	7	3.41%		0.00%		0.00%		0.00%	9	2.36%
Metatarsal	2	2.17%	6	2.93%	1	5.56%		0.00%	1	1.59%	10	2.62%
Phalanx	2	2.17%	12	5.85%	1	5.56%		0.00%	2	3.17%	17	4.45%
Radius	2	2.17%	4	1.95%	1	5.56%		0.00%	2	3.17%	9	2.36%
Rib	13	14.13%	38	18.54%	1	5.56%		0.00%	4	6.35%	56	14.66%
Scapula	4	4.35%	13	6.34%		0.00%		0.00%	5	7.94%	22	5.76%
Tarsal	2	2.17%	1	0.49%	2	11.11%		0.00%	1	1.59%	6	1.57%
Tibia	3	3.26%	5	2.44%	1	5.56%		0.00%	4	6.35%	13	3.40%
Ulna	5	5.43%	2	0.98%		0.00%		0.00%	2	3.17%	9	2.36%
Unidentifiable	1	1.09%	1	0.49%		0.00%		0.00%		0.00%	2	0.52%
Vertebra	24	26.09%	41	20.00%	7	38.89%		0.00%	8	12.70%	80	20.94%
Bovid Class 1 Total	**92**	**100.00%**	**205**	**100.00%**	**18**	**100.00%**	**4**	**100.00%**	**63**	**100.00%**	**382**	**100.00%**

Table 66. Bovid Class 2 element frequency by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus		0.00%		0.00%		0.00%		0.00%	1	0.65%		0.00%	1	0.16%
Calcaneous	2	0.47%		0.00%		0.00%		0.00%	9	5.88%		0.00%	11	1.76%
Carpal	2	0.47%		0.00%		0.00%		0.00%	3	1.96%		0.00%	5	0.80%
Cranium	35	8.25%	1	5.26%	2	18.18%		0.00%	3	1.96%	1	8.33%	42	6.72%
Femur	13	3.07%		0.00%		0.00%		0.00%	17	11.11%		0.00%	30	4.80%
Humerus	5	1.18%		0.00%		0.00%		0.00%	6	3.92%		0.00%	11	1.76%
Hyoid	1	0.24%		0.00%		0.00%		0.00%	8	5.23%		0.00%	9	1.44%
Innominate	15	3.54%	1	5.26%	1	9.09%		0.00%	6	3.92%		0.00%	23	3.68%
Long bone	31	7.31%		0.00%		0.00%		0.00%	6	3.92%		0.00%	37	5.92%
Loose tooth	1	0.24%		0.00%		0.00%	1	16.67%		0.00%		0.00%	2	0.32%
Loose tooth-lower	2	0.47%		0.00%	1	9.09%	1	16.67%	3	1.96%		0.00%	7	1.12%
Loose tooth-upper	1	0.24%		0.00%	1	9.09%	1	16.67%	1	0.65%		0.00%	4	0.64%
Mandible	12	2.83%	2	10.53%		0.00%	1	16.67%	3	1.96%	3	25.00%	21	3.36%
Mandible with teeth	2	0.47%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.32%
Metacarpal	4	0.94%	1	5.26%		0.00%		0.00%	2	1.31%		0.00%	7	1.12%
Metapodial	2	0.47%		0.00%		0.00%		0.00%	8	5.23%	1	8.33%	11	1.76%
Metatarsal	9	2.12%	1	5.26%		0.00%		0.00%	16	10.46%		0.00%	26	4.16%
Patella	3	0.71%		0.00%		0.00%	1	16.67%	1	0.65%		0.00%	5	0.80%
Phalanx	8	1.89%	1	5.26%	2	18.18%	1	16.67%	11	7.19%	1	8.33%	24	3.84%

Table 66 cont. Bovid Class 2 element frequency by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Radius	8	1.89%		0.00%	1	9.09%		0.00%	1	0.65%	1	8.33%	11	1.76%
Rib	154	36.32%	5	26.32%	1	9.09%		0.00%		0.00%	2	16.67%	162	25.92%
Scapula	11	2.59%	2	10.53%	2	18.18%		0.00%	4	2.61%	1	8.33%	20	3.20%
Sternum		0.00%	1	5.26%		0.00%		0.00%		0.00%		0.00%	1	0.16%
Tarsal		0.00%		0.00%		0.00%		0.00%	4	2.61%		0.00%	4	0.64%
Tibia	8	1.89%		0.00%		0.00%		0.00%	13	8.50%	1	8.33%	22	3.52%
Ulna	3	0.71%		0.00%		0.00%		0.00%	4	2.61%		0.00%	7	1.12%
Unidentifiable	1	0.24%		0.00%		0.00%		0.00%	1	0.65%		0.00%	2	0.32%
Vertebra	91	21.46%	4	21.05%		0.00%		0.00%	22	14.38%	1	8.33%	118	18.88%
Bovid Class 2 Total	**424**	**100%**	**19**	**100%**	**11**	**100%**	**6**	**100%**	**153**	**100%**	**12**	**100%**	**625**	**100%**

Table 67. Bovid Class 2 element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Astragalus		0.00%	1	0.32%		0.00%		0.00%		0.00%	1	0.18%
Calcaneous	1	0.62%	6	1.94%		0.00%		0.00%	3	4.05%	10	1.79%
Carpal	1	0.62%	3	0.97%		0.00%		0.00%	1	1.35%	5	0.89%
Cranium	10	6.17%	26	8.41%	1	10.00%		0.00%	2	2.70%	39	6.98%
Femur	2	1.23%	16	5.18%		0.00%		0.00%	8	10.81%	26	4.65%
Humerus	1	0.62%	4	1.29%		0.00%		0.00%	4	5.41%	9	1.61%
Hyoid	2	1.23%	3	0.97%		0.00%		0.00%	3	4.05%	8	1.43%
Innominate	6	3.70%	11	3.56%		0.00%		0.00%	2	2.70%	19	3.40%
Long bone		0.00%	34	11.00%		0.00%		0.00%	3	4.05%	37	6.62%
Loose tooth	1	0.62%	1	0.32%		0.00%		0.00%		0.00%	2	0.36%
Loose tooth-lower	2	1.23%	4	1.29%		0.00%		0.00%	1	1.35%	7	1.25%
Loose tooth-upper	1	0.62%	3	0.97%		0.00%		0.00%		0.00%	4	0.72%
Mandible	8	4.94%	9	2.91%	3	30.00%		0.00%		0.00%	20	3.58%
Mandible with teeth		0.00%	1	0.32%		0.00%		0.00%	1	1.35%	2	0.36%
Metacarpal	3	1.85%	2	0.65%	1	10.00%		0.00%	1	1.35%	7	1.25%
Metapodial	1	0.62%	7	2.27%		0.00%		0.00%	3	4.05%	11	1.97%
Metatarsal	8	4.94%	7	2.27%	1	10.00%	2	50.00%	2	2.70%	20	3.58%
Patella		0.00%	3	0.97%	1	10.00%		0.00%	1	1.35%	5	0.89%
Phalanx		0.00%	15	4.85%		0.00%		0.00%	5	6.76%	20	3.58%
Radius	5	3.09%	3	0.97%		0.00%		0.00%	1	1.35%	9	1.61%
Rib	57	35.19%	84	27.18%	2	20.00%		0.00%	8	10.81%	151	27.01%
Scapula	2	1.23%	7	2.27%		0.00%	1	25.00%	5	6.76%	15	2.68%
Sternum		0.00%	1	0.32%		0.00%		0.00%		0.00%	1	0.18%

Table 67 cont. Bovid Class 2 element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Tarsal		0.00%	1	0.32%		0.00%		0.00%	3	4.05%	4	0.72%
Tibia	6	3.70%	6	1.94%		0.00%		0.00%	6	8.11%	18	3.22%
Ulna		0.00%	5	1.62%		0.00%		0.00%	2	2.70%	7	1.25%
Unidentifiable		0.00%		0.00%		0.00%		0.00%	1	1.35%	1	0.18%
Vertebra	45	27.78%	46	14.89%	1	10.00%	1	25.00%	8	10.81%	101	18.07%
Bovid Class 2 Total	**162**	**100%**	**309**	**100%**	**10**	**100%**	**4**	**100%**	**74**	**100%**	**559**	**100%**

Table 68. **Bovid Class 3 element frequency by area.**

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Astragalus	2	0.37%		0.00%		0.00%		0.00%	1	1.32%		0.00%		0.00%	3	0.40%
Calcaneous	2	0.37%		0.00%		0.00%		0.00%	1	1.32%		0.00%	1	50.00%	4	0.53%
Carpal		0.00%		0.00%		0.00%		0.00%	2	2.63%		0.00%		0.00%	2	0.27%
Carpal/tarsal	1	0.19%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.13%
Cranium	89	16.60%	5	10.00%		0.00%	1	12.50%	4	5.26%	5	23.81%		0.00%	104	13.83%
Femur	14	2.61%	4	8.00%	1	1.69%		0.00%	4	5.26%	1	4.76%		0.00%	24	3.19%
Flat bone	4	0.75%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.53%
Humerus	6	1.12%	2	4.00%		0.00%		0.00%	7	9.21%		0.00%		0.00%	15	1.99%
Hyoid	1	0.19%		0.00%		0.00%		0.00%	6	7.89%		0.00%		0.00%	7	0.93%
Innominate	6	1.12%	1	2.00%	3	5.08%		0.00%	1	1.32%		0.00%		0.00%	11	1.46%
Long bone	53	9.89%		0.00%	1	1.69%		0.00%		0.00%	1	4.76%		0.00%	55	7.31%
Loose tooth	17	3.17%	1	2.00%		0.00%	1	12.50%		0.00%	1	4.76%		0.00%	20	2.66%
Loose tooth-lower	13	2.43%		0.00%	2	3.39%	1	12.50%	1	1.32%		0.00%		0.00%	17	2.26%
Loose tooth-upper	3	0.56%	2	4.00%		0.00%	2	25.00%	1	1.32%		0.00%		0.00%	8	1.06%
Mandible	15	2.80%	19	38.00%	1	1.69%		0.00%	3	3.95%	3	14.29%		0.00%	41	5.45%
Mandible with teeth	3	0.56%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	3	0.40%
Metacarpal	5	0.93%		0.00%		0.00%	1	12.50%	1	1.32%		0.00%		0.00%	7	0.93%
Metapodial	6	1.12%	2	4.00%		0.00%		0.00%	6	7.89%		0.00%		0.00%	14	1.86%
Metatarsal	11	2.05%		0.00%		0.00%		0.00%	3	3.95%		0.00%		0.00%	14	1.86%
Patella	1	0.19%		0.00%		0.00%		0.00%	2	2.63%		0.00%		0.00%	3	0.40%
Phalanx	19	3.54%	1	2.00%	2	3.39%	1	12.50%	7	9.21%		0.00%		0.00%	30	3.99%
Radius	13	2.43%	2	4.00%	1	1.69%		0.00%		0.00%	1	4.76%		0.00%	17	2.26%
Radius, ulna	2	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.27%

Table 68 cont. Bovid Class 3 element frequency by area.

	Dun g		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Rib	87	16.23%	3	6.00%	37	62.71%		0.00%		0.00%	4	19.05%		0.00%	131	17.42 %
Scapula	16	2.99%		0.00%	2	3.39%		0.00%	3	3.95%		0.00%		0.00%	21	2.79%
Sesamoid	1	0.19%		0.00%		0.00%		0.00%	4	5.26%		0.00%		0.00%	5	0.66%
Tarsal	4	0.75%		0.00%		0.00%		0.00%	4	5.26%		0.00%		0.00%	8	1.06%
Tibia	4	0.75%	1	2.00%		0.00%		0.00%	1	1.32%	2	9.52%		0.00%	8	1.06%
Ulna	1	0.19%		0.00%		0.00%	1	12.50%		0.00%	1	4.76%		0.00%	3	0.40%
Unidentifiable	21	3.92%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	21	2.79%
Vertebra	116	21.64%	7	14.00%	9	15.25%		0.00%	14	18.42%	2	9.52%	1	50.00 %	149	19.81 %
Bovid Class 3 Total	**536**	**100%**	**50**	**100%**	**59**	**100%**	**8**	**100%**	**76**	**100%**	**21**	**100%**	**2**	**100%**	**752**	**100%**

Table 69. **Bovid Class 3 element frequency by pan site secure horizon.**

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Astragalus		0.00%	1	0.28%		0.00%		0.00%	1	0.65%	2	0.28%
Calcaneous	1	0.76%	1	0.28%		0.00%		0.00%	2	1.29%	4	0.57%
Carpal	2	1.53%		0.00%		0.00%		0.00%		0.00%	2	0.28%
Carpal/tarsal	1	0.76%		0.00%		0.00%		0.00%		0.00%	1	0.14%
Cranium	15	11.45%	42	11.67%	21	39.62%		0.00%	25	16.13%	103	14.65%
Femur	2	1.53%	9	2.50%	3	5.66%		0.00%	8	5.16%	22	3.13%
Flat bone	1	0.76%	3	0.83%		0.00%		0.00%		0.00%	4	0.57%
Humerus	1	0.76%	6	1.67%	1	1.89%		0.00%	4	2.58%	12	1.71%
Hyoid	1	0.76%	2	0.56%		0.00%		0.00%	2	1.29%	5	0.71%
Innominate	2	1.53%	7	1.94%	1	1.89%		0.00%	1	0.65%	11	1.56%
Long bone	12	9.16%	33	9.17%		0.00%		0.00%	9	5.81%	54	7.68%
Loose tooth	3	2.29%	11	3.06%	1	1.89%		0.00%	4	2.58%	19	2.70%
Loose tooth-lower	4	3.05%	9	2.50%		0.00%		0.00%	4	2.58%	17	2.42%
Loose tooth-upper		0.00%	3	0.83%	1	1.89%		0.00%	3	1.94%	7	1.00%
Mandible	6	4.58%	12	3.33%	19	35.85%		0.00%	1	0.65%	38	5.41%
Mandible with teeth	2	1.53%	1	0.28%		0.00%		0.00%		0.00%	3	0.43%
Metacarpal		0.00%	2	0.56%	1	1.89%		0.00%	4	2.58%	7	1.00%
Metapodial	3	2.29%	7	1.94%	1	1.89%		0.00%	3	1.94%	14	1.99%
Metatarsal	5	3.82%	5	1.39%		0.00%		0.00%	1	0.65%	11	1.56%
Patella		0.00%	2	0.56%		0.00%		0.00%	1	0.65%	3	0.43%
Phalanx	8	6.11%	12	3.33%		0.00%		0.00%	8	5.16%	28	3.98%
Radius	1	0.76%	12	3.33%		0.00%		0.00%	3	1.94%	16	2.28%
Radius, ulna	1	0.76%	1	0.28%		0.00%		0.00%		0.00%	2	0.28%
Rib	26	19.85%	84	23.33%		0.00%		0.00%	19	12.26%	129	18.35%
Scapula	4	3.05%	5	1.39%		0.00%		0.00%	3	1.94%	12	1.71%

Table 69 cont. Bovid Class 3 element frequency by pan site secure horizon.

	1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Sesamoid	1	0.76%	2	0.56%		0.00%		0.00%	2	1.29%	5	0.71%
Tarsal	4	3.05%	3	0.83%		0.00%		0.00%	1	0.65%	8	1.14%
Tibia	2	1.53%	3	0.83%		0.00%		0.00%	3	1.94%	8	1.14%
Ulna	1	0.76%	2	0.56%		0.00%		0.00%		0.00%	3	0.43%
Unidentifiable		0.00%	2	0.56%		0.00%		0.00%	19	12.26%	21	2.99%
Vertebra	22	16.79%	78	21.67%	4	7.55%	4	100.00%	24	15.48%	132	18.78%
Bovid Class 3 Total	**131**	**100%**	**360**	**100%**	**53**	**100%**	**4**	**100%**	**155**	**100%**	**703**	**100%**

Table 70. Bovid Class 4 element frequency by area.

	Dung		Midden 2		Mound		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Cranium	1	7.69%		0.00%	1	9.09%	2	7.14%
Femur	2	15.38%		0.00%		0.00%	2	7.14%
Long bone	1	7.69%		0.00%		0.00%	1	3.57%
Loose tooth-upper	1	7.69%		0.00%		0.00%	1	3.57%
Metatarsal	1	7.69%		0.00%		0.00%	1	3.57%
Phalanx		0.00%		0.00%	1	9.09%	1	3.57%
Rib	5	38.46%	3	75.00%	2	18.18%	10	35.71%
Unidentifiable		0.00%		0.00%	7	63.64%	7	25.00%
Vertebra	2	15.38%	1	25.00%		0.00%	3	10.71%
Bovid Class 4 Total	**13**	**100.00%**	**4**	**100.00%**	**11**	**100.00%**	**28**	**100.00%**

Table 71. Bovid Class 4 element frequency by pan site secure horizon.

	1. Lower		2. Middle		3b. Upper		4. Plough		Total NISP	Total %
Element Type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Cranium	1	12.50%		0.00%		0.00%		0.00%	1	4.17%
Femur	1	12.50%		0.00%		0.00%	1	33.33%	2	8.33%
Long bone		0.00%	1	8.33%		0.00%		0.00%	1	4.17%
Metatarsal		0.00%	1	8.33%		0.00%		0.00%	1	4.17%
Phalanx	1	12.50%		0.00%		0.00%		0.00%	1	4.17%
Rib	4	50.00%	3	25.00%	1	100.00%	2	66.67%	10	41.67%
Unidentifiable		0.00%	5	41.67%		0.00%		0.00%	5	20.83%
Vertebra	1	12.50%	2	16.67%		0.00%		0.00%	3	12.50%
Bovid Class 4 Total	**8**	**100.00%**	**12**	**100.00%**	**1**	**100.00%**	**3**	**100.00%**	**24**	**100.00%**

Table 72. List of all species and elements measured from the 1982-1983 and 1995-1997 archaeological campaigns at Ndondondwane

Site Area	Species	Element Type	NISP	%
Dung				
	Bos taurus			
		Astragalus	3	2.40%
		Cranium	1	0.80%
		Loose tooth-lower	1	0.80%
		Loose tooth-upper	2	1.60%
		Metacarpal	3	2.40%
		Metatarsal	3	2.40%
		Patella	1	0.80%
		Phalanx	6	4.80%
		Scapula	1	0.80%
		Tarsal	3	2.40%
	Bos taurus Total		**24**	**19.20%**
	Bovid Class 1			
		Metacarpal	1	0.80%
	Bovid Class 1 Total		**1**	**0.80%**
	Canis familiaris			
		Calcaneous	1	0.80%
		Metacarpal	1	0.80%
		Metatarsal	1	0.80%
		Scapula	2	1.60%
		Ulna	1	0.80%
	Canis familiaris Total		**6**	**4.80%**
	Canis sp.			
		Humerus	1	0.80%
	Canis sp. Total		**1**	**0.80%**
	Capra hircus			
		Astragalus	2	1.60%
		Calcaneous	2	1.60%
		Humerus	4	3.20%
		Metacarpal	1	0.80%
		Metapodial	1	0.80%
		Metatarsal	1	0.80%
		Radius	1	0.80%
		Scapula	4	3.20%
		Tibia	2	1.60%
		Ulna	1	0.80%
	Capra hircus Total		**19**	**15.20%**

Table 72 cont. List of all species and elements measured from the 1982-1983 and 1995-1997 archaeological campaigns at Ndondondwane

Site Area	Species	Element Type	NISP	%
Dung				
	Hippopotamus amphibius			
		Astragalus	2	1.60%
		Phalanx	1	0.80%
	Hippopotamus amphibius Total		**3**	**2.40%**
	Mammal-Medium			
		Femur	1	0.80%
	Mammal-Medium Total		**1**	**0.80%**
	Oreotragus oreotragus			
		Metatarsal	1	0.80%
	Oreotragus oreotragus Total		**1**	**0.80%**
	Ovis aries			
		Astragalus	7	5.60%
		Calcaneous	4	3.20%
		Femur	5	4.00%
		Humerus	2	1.60%
		Innominate	1	0.80%
		Metacarpal	1	0.80%
		Metapodial	7	5.60%
		Metatarsal	2	1.60%
		Patella	1	0.80%
		Phalanx	1	0.80%
		Radius	2	1.60%
		Scapula	7	5.60%
		Tibia	3	2.40%
		Ulna	3	2.40%
	Ovis aries Total		**46**	**36.80%**

Table 72 cont. List of all species and elements measured from the 1982-1983 and 1995-1997 archaeological campaigns at Ndondondwane

Site Area	Species	Element Type	NISP	%
Dung				
	Ovis/Capra			
		Cranium	5	4.00%
		Femur	1	0.80%
		Humerus	2	1.60%
		Innominate	3	2.40%
		Metacarpal	1	0.80%
		Metapodial	3	2.40%
		Metatarsal	1	0.80%
		Radius	1	0.80%
		Rib	1	0.80%
	Ovis/Capra Total		**18**	**14.40%**
	Sylvicapra grimmia			
		Metacarpal	1	0.80%
		Scapula	1	0.80%
		Tibia	1	0.80%
			3	**2.40%**
	Sylvicapra grimmia Total		**3**	**2.40%**
	Canis familiaris cf.			
		Astragalus	1	0.80%
	Canis familiaris cf. Total		**1**	**0.80%**
Dung Total			**124**	**99.20%**
Midden 1				
	Ovis aries			
		Scapula	1	0.80%
	Ovis aries Total		**1**	**0.80%**
Midden 1 Total			**1**	**0.80%**
Grand Total			**125**	**100.00%**

Table 73b. Modified harvest profile for domestic species (with subadult/adult age group removed) for Ndondondwane.

	Bos taurus		Capra hircus		Ovis aries		Total NISP	Total %
Age	NISP	%	NISP	%	NISP	%		
1. Foetal	6	0.40%		0.00%		0.00%	6	0.21%
3. Infant	17	1.12%	8	2.11%	31	3.28%	56	1.97%
5. Juvenile	385	25.45%	55	14.47%	203	21.48%	643	22.66%
7. Subadult	419	27.69%	112	29.47%	326	34.50%	857	30.20%
9. Adult	686	45.34%	205	53.95%	385	40.74%	1276	44.96%
Grand Total	**1513**	**100.00%**	**380**	**100.00%**	**945**	**100.00%**	**2838**	**100.00%**

Table 73c. Aging and sexing frequencies for domestics at Ndondondwane.

		Bos taurus		Capra hircus		Ovis aries		Total NISP	Total %
Age	Sex	NISP	%	NISP	%	NISP	%		
3. Infant									
	Male		0.00%		0.00%	3	4.41%	3	2.22%
	Male?		0.00%	1	3.33%		0.00%	1	0.74%
3. Infant Total			**0.00%**	**1**	**3.33%**	**3**	**4.41%**	**4**	**2.96%**
5. Juvenile									
	Female		0.00%	2	6.67%	2	2.94%	4	2.96%
	Male	3	8.11%	2	6.67%	12	17.65%	17	12.59%
	Male?	3	8.11%		0.00%		0.00%	3	2.22%
5. Juvenile Total		**6**	**16.22%**	**4**	**13.33%**	**14**	**20.59%**	**24**	**17.78%**
7. Subadult									
	Female	1	2.70%		0.00%	4	5.88%	5	3.70%
	Female?	1	2.70%		0.00%	2	2.94%	3	2.22%
	Male	4	10.81%		0.00%	10	14.71%	14	10.37%
	Male?	2	5.41%	1	3.33%		0.00%	3	2.22%
7. Subadult Total		**8**	**21.62%**	**1**	**3.33%**	**16**	**23.53%**	**25**	**18.52%**
9. Adult									
	Female	8	21.62%	6	20.00%	17	25.00%	31	22.96%
	Female?	2	5.41%		0.00%	2	2.94%	4	2.96%
	Male	2	5.41%	18	60.00%	15	22.06%	35	25.93%
	Male?	11	29.73%		0.00%	1	1.47%	12	8.89%
9. Adult Total		**23**	**62.16%**	**24**	**80.00%**	**35**	**51.47%**	**82**	**60.74%**
Grand Total		**37**	**100.00%**	**30**	**100.00%**	**68**	**100.00%**	**135**	**100.00%**

Table 74. Harvest profile for domestic species by Lower and Middle Horizons.

		Bos taurus		Capra hircus		Ovis aries		Ovis/Capra		Total NISP	Total %
Secured Horizons	Age	NISP	%	NISP	%	NISP	%	NISP	%		
1. Lower											
	1. Foetal	1	0.24%		0.00%		0.00%		0.00%	1	0.08%
	3. Infant	10	2.38%	2	2.06%	5	2.72%	28	4.58%	45	3.42%
	5. Juvenile	82	19.48%	12	12.37%	35	19.02%	170	27.78%	299	22.75%
	7. Subadult	82	19.48%	28	28.87%	56	30.43%	101	16.50%	267	20.32%
	8. Subadult/adult	111	26.37%	19	19.59%	37	20.11%	176	28.76%	343	26.10%
	9. Adult	135	32.07%	36	37.11%	51	27.72%	137	22.39%	359	27.32%
1. Lower Total		**421**	**100.00%**	**97**	**100.00%**	**184**	**100.00%**	**612**	**100.00%**	**1314**	**100.00%**

		Species	Data								
		Bos taurus		Capra hircus		Ovis aries		Ovis/Capra		Total NISP	Total %
Secured Horizons	Age	NISP	%	NISP	%	NISP	%	NISP	%		
2. Middle											
	1. Foetal	4	0.41%		0.00%		0.00%	3	0.26%	7	0.24%
	3. Infant	6	0.62%	2	1.02%	13	2.26%	48	4.20%	69	2.39%
	5. Juvenile	152	15.69%	12	6.09%	109	18.99%	282	24.69%	555	19.26%
	7. Subadult	207	21.36%	47	23.86%	134	23.34%	262	22.94%	650	22.55%
	8. Subadult/adult	236	24.36%	54	27.41%	149	25.96%	307	26.88%	746	25.88%
	9. Adult	364	37.56%	82	41.62%	169	29.44%	240	21.02%	855	29.67%
2. Middle Total		**969**	**100.00%**	**197**	**100.00%**	**574**	**100.00%**	**1142**	**100.00%**	**2882**	**100.00%**

Table 75. Harvest profile of domestic species for lower and middle horizons without subadult/adult age group.

		Species Data									
		Bos taurus		Capra hircus		Ovis aries		Ovis/Capra		Total NISP	Total %
Secured Horizon	Age	NISP	%	NISP	%	NISP	%	NISP	%		
1. Lower											
	1. Foetal	1	0.32%		0.00%		0.00%		0.00%	1	0.10%
	3. Infant	10	3.23%	2	2.56%	5	3.40%	28	6.42%	45	4.63%
	5. Juvenile	82	26.45%	12	15.38%	35	23.81%	170	38.99%	299	30.79%
	7. Subadult	82	26.45%	28	35.90%	56	38.10%	101	23.17%	267	27.50%
	9. Adult	135	43.55%	36	46.15%	51	34.69%	137	31.42%	359	36.97%
1. Lower Total		**310**	**100.00%**	**78**	**100.00%**	**147**	**100.00%**	**436**	**100.00%**	**971**	**100.00%**

		Species Data									
		Bos taurus		Capra hircus		Ovis aries		Ovis/Capra		Total NISP	Total %
Secured Horizon	Age	NISP	%	NISP	%	NISP	%	NISP	%		
2. Middle											
	1. Foetal	4	0.55%		0.00%		0.00%	3	0.36%	7	0.33%
	3. Infant	6	0.82%	2	1.40%	13	3.06%	48	5.75%	69	3.23%
	5. Juvenile	152	20.74%	12	8.39%	109	25.65%	282	33.77%	555	25.98%
	7. Subadult	207	28.24%	47	32.87%	134	31.53%	262	31.38%	650	30.43%
	9. Adult	364	49.66%	82	57.34%	169	39.76%	240	28.74%	855	40.03%
2. Middle Total		**733**	**100%**	**143**	**100%**	**425**	**100%**	**835**	**100%**	**2136**	**100%**

Table 75a. Harvest profile of domestic species for lower horizon.

		Bos taurus		Capra hircus		Ovis aries		Ovis/Capra		Total NISP	Total %
Secure Horizon	Age	NISP	%	NISP	%	NISP	%	NISP	%		
1. Lower											
	1. Foetal	1	0.32%		0.00%		0.00%		0.00%	1	0.10%
	3. Infant	10	3.23%	2	2.56%	5	3.40%	28	6.42%	45	4.63%
	5. Juvenile	82	26.45%	12	15.38%	35	23.81%	170	38.99%	299	30.79%
	7. Subadult	82	26.45%	28	35.90%	56	38.10%	101	23.17%	267	27.50%
	9. Adult	135	43.55%	36	46.15%	51	34.69%	137	31.42%	359	36.97%
1. Lower Total		310	100.00%	78	100.00%	147	100.00%	436	100.00%	971	100.00%
Grand Total		310	100.00%	78	100.00%	147	100.00%	436	100.00%	971	100.00%

Table 75b. Harvest profile of domestic species for middle horizon.

		Bos taurus		Capra hircus		Ovis aries		Ovis/Capra		Total NISP	Total %
Secured Horizon	Age	NISP	%	NISP	%	NISP	%	NISP	%		
2. Middle											
	1. Foetal	4	0.55%		0.00%		0.00%	3	0.36%	7	0.33%
	3. Infant	6	0.82%	2	1.40%	13	3.06%	48	5.75%	69	3.23%
	5. Juvenile	152	20.74%	12	8.39%	109	25.65%	282	33.77%	555	25.98%
	7. Subadult	207	28.24%	47	32.87%	134	31.53%	262	31.38%	650	30.43%
	9. Adult	364	49.66%	82	57.34%	169	39.76%	240	28.74%	855	40.03%
2. Middle Total		733	100.00%	143	100.00%	425	100.00%	835	100.00%	2136	100.00%

Table 76. Harvest profile of cattle by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Age	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
1. Foetal		0.00%		0.00%		0.00%		0.00%	6	0.79%		0.00%		0.00%	6	0.30%
3. Infant	7	0.70%		0.00%		0.00%		0.00%	10	1.32%		0.00%		0.00%	17	0.85%
5. Juvenile	156	15.51%	11	14.86%	11	12.64%	4	12.50%	203	26.85%		0.00%		0.00%	385	19.35%
7. Subadult	215	21.37%	11	14.86%	18	20.69%	7	21.88%	165	21.83%	2	6.06%	1	50.00%	419	21.06%
8. Subadult /adult	230	22.86%	25	33.78%	27	31.03%	10	31.25%	164	21.69%	20	60.61%	1	50.00%	477	23.97%
9. Adult	398	39.56%	27	36.49%	31	35.63%	11	34.38%	208	27.51%	11	33.33%		0.00%	686	34.47%
Bos taurus Total	**1006**	**100%**	**74**	**100%**	**87**	**100%**	**32**	**100%**	**756**	**100%**	**33**	**100%**	**2**	**100%**	**1990**	**100%**

Table 77. Harvest profile for goats by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Total NISP	Total %
Age	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
3. Infant	3	2.31%		0.00%		0.00%	5	2.06%		0.00%	8	2.11%
5. Juvenile	14	10.77%		0.00%		0.00%	41	16.87%		0.00%	55	14.47%
7. Subadult	46	35.38%	1	20.00%		0.00%	65	26.75%		0.00%	112	29.47%
9. Adult	67	51.54%	4	80.00%	1	100.00%	132	54.32%	1	100.00%	205	53.95%
Capra hircus Total	**130**	**100.00%**	**5**	**100.00%**	**1**	**100.00%**	**243**	**100.00%**	**1**	**100.00%**	**380**	**100.00%**

Table 78. Harvest profile for sheep by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Total NISP	Total %
Age	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
3. Infant	11	3.68%		0.00%		0.00%		0.00%	20	3.42%		0.00%	31	3.28%
5. Juvenile	57	19.06%	9	23.08%	6	35.29%		0.00%	130	22.22%	1	25.00%	203	21.48%
7. Subadult	118	39.46%	5	12.82%	7	41.18%		0.00%	195	33.33%	1	25.00%	326	34.50%
9. Adult	113	37.79%	25	64.10%	4	23.53%	1	100%	240	41.03%	2	50.00%	385	40.74%
Ovis aries Total	**299**	**100%**	**39**	**100%**	**17**	**100%**	**1**	**100%**	**585**	**100%**	**4**	**100%**	**945**	**100%**

Table 79. Harvest profile for sheep/goats by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Age	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
1. Foetal		0.00%	1	1.47%		0.00%		0.00%	2	0.27%		0.00%		0.00%	3	0.16%
3. Infant	46	4.78%	3	4.41%	4	8.16%		0.00%	43	5.87%		0.00%		0.00%	96	5.17%
5. Juvenile	304	31.57%	21	30.88%	10	20.41%	11	44.00%	375	51.16%	6	40.00%	2	40.00%	729	39.24%
7. Subadult	300	31.15%	27	39.71%	16	32.65%	5	20.00%	156	21.28%	5	33.33%	1	20.00%	510	27.45%
9. Adult	313	32.50%	16	23.53%	19	38.78%	9	36.00%	157	21.42%	4	26.67%	2	40.00%	520	27.99%
Ovis/Capra Total	**963**	**100%**	**68**	**100%**	**49**	**100%**	**25**	**100%**	**733**	**100%**	**15**	**100%**	**5**	**100%**	**1858**	**100%**

Table 79a. Harvest profiles of wild assemblage at Ndondondwane.

		3. Infant		5. Juvenile		7. Subadult		8. Subadult/adult		9. Adult		Total NISP	Total %
Domestic?	Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Wild													
	Aepyceros melampus		0.00%		0.00%	1	0.44%		0.00%	3	0.70%	4	0.33%
	Bovid Class 1	1	11.11%	7	5.43%	3	1.33%	12	2.91%	26	6.10%	49	4.08%
	Bovid Class 2		0.00%	8	6.20%	27	11.95%	18	4.37%	72	16.90%	125	10.40%
	Bovid Class 2/3		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Bovid Class 3		0.00%	3	2.33%	14	6.19%	26	6.31%	37	8.69%	80	6.66%
	Bovid Class 4		0.00%		0.00%	2	0.88%	6	1.46%	3	0.70%	11	0.92%
	Canis sp.		0.00%	1	0.78%	1	0.44%	1	0.24%	4	0.94%	7	0.58%
	Carnivore Class 1		0.00%	1	0.78%	3	1.33%		0.00%	2	0.47%	6	0.50%
	Carnivore Class 2		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Equus sp.		0.00%		0.00%		0.00%	1	0.24%		0.00%	1	0.08%
	Felis sp.		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Giraffa camelopardalis		0.00%		0.00%		0.00%	1	0.24%	3	0.70%	4	0.33%
	Hippopotamus amphibius	1	11.11%	25	19.38%	51	22.57%	65	15.78%	27	6.34%	169	14.06%
	Hyaena/Crocuta		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Hystrix africaeaustralis		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Leporid sp.		0.00%	2	1.55%		0.00%	1	0.24%	2	0.47%	5	0.42%
	Lepus sp.		0.00%		0.00%	1	0.44%	1	0.24%	4	0.94%	6	0.50%
	Loxodonta africana		0.00%		0.00%		0.00%	1	0.24%		0.00%	1	0.08%
	Mammal-Small		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Mammal-Very Large		0.00%		0.00%	1	0.44%	1	0.24%	1	0.23%	3	0.25%
	Oreotragus oreotragus		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Ourebia ourebi	1	11.11%	1	0.78%	2	0.88%	1	0.24%		0.00%	5	0.42%
	Pedetes capensis		0.00%		0.00%		0.00%		0.00%	2	0.47%	2	0.17%

Table 79a cont. Harvest profiles of wild assemblage at Ndondondwane.

		3. Infant		5. Juvenile		7. Subadult		8. Subadult/adult		9. Adult		Total NISP	Total %
Domestic?	Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
	Phacochoerus aethiopicus		0.00%		0.00%		0.00%		0.00%	2	0.47%	2	0.17%
	Philantomba monticola	1	11.11%	1	0.78%		0.00%		0.00%		0.00%	2	0.17%
	Potamochoerus porcus		0.00%		0.00%	1	0.44%		0.00%		0.00%	1	0.08%
	Procavia capensis		0.00%		0.00%	1	0.44%		0.00%		0.00%	1	0.08%
	Procavia/Dendrohyrax		0.00%		0.00%	3	1.33%		0.00%		0.00%	3	0.25%
	Raphicerus campestris		0.00%	3	2.33%	1	0.44%	2	0.49%	4	0.94%	10	0.83%
	Redunca fulvorufula		0.00%		0.00%	1	0.44%	2	0.49%	4	0.94%	7	0.58%
	Suid sp.		0.00%		0.00%		0.00%	2	0.49%	4	0.94%	6	0.50%
	Sylvicapra grimmia		0.00%	2	1.55%	1	0.44%	4	0.97%	17	3.99%	24	2.00%
	Syncerus caffer		0.00%		0.00%		0.00%		0.00%	2	0.47%	2	0.17%
	Taurotragus oryx		0.00%	1	0.78%		0.00%		0.00%		0.00%	1	0.08%
	Viveridae sp.		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Viverra civetta		0.00%	1	0.78%		0.00%	1	0.24%		0.00%	2	0.17%
Wild Total		**4**	**44.44%**	**56**	**43.41%**	**114**	**50.44%**	**146**	**35.44%**	**227**	**53.29%**	**547**	**45.51%**
Wild?													
	Bovid Class 1	1	11.11%	20	15.50%	15	6.64%	45	10.92%	20	4.69%	101	8.40%
	Bovid Class 2	2	22.22%	25	19.38%	29	12.83%	62	15.05%	50	11.74%	168	13.98%
	Bovid Class 2/3		0.00%		0.00%		0.00%		0.00%	1	0.23%	1	0.08%
	Bovid Class 3	2	22.22%	24	18.60%	59	26.11%	132	32.04%	86	20.19%	303	25.21%
	Bovid Class 4		0.00%	1	0.78%		0.00%	5	1.21%	3	0.70%	9	0.75%
	Canis sp.		0.00%	3	2.33%	8	3.54%	19	4.61%	36	8.45%	66	5.49%
	Mammal-Large		0.00%		0.00%		0.00%	1	0.24%	1	0.23%	2	0.17%
	Mammal-Medium		0.00%		0.00%		0.00%	1	0.24%	1	0.23%	2	0.17%
	Mammal-Small		0.00%		0.00%	1	0.44%	1	0.24%	1	0.23%	3	0.25%
Wild? Total		**5**	**55.56%**	**73**	**56.59%**	**112**	**49.56%**	**266**	**64.56%**	**199**	**46.71%**	**655**	**54.49%**
Grand Total		**9**	**100%**	**129**	**100%**	**226**	**100%**	**412**	**100%**	**426**	**100%**	**1202**	**100%**

Table 80. Frequency of sexing by species at Ndondondwane.

		Castrate		Female		Female?		Male		Male?		Total NISP	Total %
Domestication	**Species**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Domestic	Bos taurus		0.00%	16	13.91%	3	17.65%	20	11.11%	16	69.57%	55	16.37%
	Capra hircus		0.00%	22	19.13%		0.00%	28	15.56%	2	8.70%	52	15.48%
	Gallus domesticus		0.00%		0.00%		0.00%	1	0.56%		0.00%	1	0.30%
	Ovis aries		0.00%	52	45.22%	8	47.06%	79	43.89%	2	8.70%	141	41.96%
	Ovis/Capra	1	100.00%	19	16.52%	5	29.41%	39	21.67%	1	4.35%	65	19.35%
Domestic Total		**1**	**100.00%**	**109**	**94.78%**	**16**	**94.12%**	**167**	**92.78%**	**21**	**91.30%**	**314**	**93.45%**
Wild													
	Aves sp.		0.00%		0.00%		0.00%	1	0.56%		0.00%	1	0.30%
	Bovid Class 2		0.00%	2	1.74%		0.00%	3	1.67%		0.00%	5	1.49%
	Bovid Class 3		0.00%	1	0.87%		0.00%		0.00%		0.00%	1	0.30%
	Cercopithecus pygerythus		0.00%		0.00%		0.00%		0.00%	1	4.35%	1	0.30%
	Felis sp.		0.00%		0.00%		0.00%		0.00%	1	4.35%	1	0.30%
	Francolinus natalensis		0.00%	1	0.87%		0.00%		0.00%		0.00%	1	0.30%
	Pelea capreolus cf.		0.00%		0.00%		0.00%	1	0.56%		0.00%	1	0.30%
	Redunca fulvorufula		0.00%	1	0.87%		0.00%	1	0.56%		0.00%	2	0.60%
	Suid sp.		0.00%		0.00%		0.00%	3	1.67%		0.00%	3	0.89%
	Sylvicapra grimmia		0.00%		0.00%		0.00%	1	0.56%		0.00%	1	0.30%
Wild Total			**0.00%**	**5**	**4.35%**		**0.00%**	**10**	**5.56%**	**2**	**8.70%**	**17**	**5.06%**
Wild?													
	Bird-Medium		0.00%		0.00%		0.00%	1	0.56%		0.00%	1	0.30%
	Bovid Class 2		0.00%		0.00%		0.00%	2	1.11%		0.00%	2	0.60%
	Bovid Class 3		0.00%	1	0.87%		0.00%		0.00%		0.00%	1	0.30%
	Canis sp.		0.00%		0.00%	1	5.88%		0.00%		0.00%	1	0.30%
Wild? Total			**0.00%**	**1**	**0.87%**	**1**	**5.88%**	**3**	**1.67%**		**0.00%**	**5**	**1.49%**
Grand Total		**1**	**100.00%**	**115**	**100.00%**	**17**	**100.00%**	**180**	**100.00%**	**23**	**100.00%**	**336**	**100.00%**

Table 81. Frequency of butchering by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Surface		Transect 1		Total NISP	Total %
Species	**Butchering Type**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Bos taurus																	
	Chopped	64	14.38%	5	17.24%	3	15.00%		0.00%	98	16.53%		0.00%	1	20.00%	171	15.50%
	Chopped and sliced	5	1.12%		0.00%		0.00%		0.00%	3	0.51%		0.00%	1	20.00%	9	0.82%
	Chopped and snapped	2	0.45%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.18%
	Impact fractures	2	0.45%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.18%
	Sliced	59	13.26%	1	3.45%	1	5.00%	1	10.00%	23	3.88%		0.00%		0.00%	85	7.71%
Bos taurus Total		**132**	**29.66%**	**6**	**20.69%**	**4**	**20.00%**	**1**	**10.00%**	**124**	**20.91%**		**0.00%**	**2**	**40.00%**	**269**	**24.39%**
Bovid Class 1																	
	Chopped	2	0.45%		0.00%	1	5.00%		0.00%	1	0.17%		0.00%		0.00%	4	0.36%
	Sliced	4	0.90%	1	3.45%		0.00%		0.00%	2	0.34%		0.00%	1	20.00%	8	0.73%
Bovid Class 1 Total		**6**	**1.35%**	**1**	**3.45%**	**1**	**5.00%**		**0.00%**	**3**	**0.51%**		**0.00%**	**1**	**20.00%**	**12**	**1.09%**
Bovid Class 2																	
	Chopped	8	1.80%		0.00%		0.00%		0.00%	4	0.67%		0.00%		0.00%	12	1.09%
	Chopped and sliced	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Scored around shaft	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	25	5.62%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	25	2.27%
Bovid Class 2 Total		**35**	**7.87%**		**0.00%**		**0.00%**		**0.00%**	**4**	**0.67%**		**0.00%**		**0.00%**	**39**	**3.54%**

Table 81 cont. Frequency of butchering by area.

Species	Butchering Type	Dung NISP	Dung %	Midden 1 NISP	Midden 1 %	Midden 2 NISP	Midden 2 %	Midden 3 NISP	Midden 3 %	Mound NISP	Mound %	Surface NISP	Surface %	Transect 1 NISP	Transect 1 %	Total NISP	Total %
Bovid Class 2/3																	
	Chopped	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
Bovid Class 2/3 Total		**2**	**0.45%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.18%**
Bovid Class 3																	
	Chopped	18	4.04%	3	10.34%	2	10.00%		0.00%	9	1.52%		0.00%		0.00%	32	2.90%
	Chopped and sliced	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Chopped and snapped	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Impact fractures	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	18	4.04%		0.00%	1	5.00%		0.00%	1	0.17%		0.00%		0.00%	20	1.81%
Bovid Class 3 Total		**39**	**8.76%**	**3**	**10.34%**	**3**	**15.00%**		**0.00%**	**10**	**1.69%**		**0.00%**		**0.00%**	**55**	**4.99%**
Bovid Class 4																	
	Chopped	1	0.22%		0.00%		0.00%		0.00%	2	0.34%		0.00%		0.00%	3	0.27%
	Sliced	1	0.22%		0.00%	1	5.00%		0.00%		0.00%		0.00%		0.00%	2	0.18%
Bovid Class 4 Total		**2**	**0.45%**		**0.00%**	**1**	**5.00%**		**0.00%**	**2**	**0.34%**		**0.00%**		**0.00%**	**5**	**0.45%**
Canis familiaris																	
	Chopped	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
Canis familiaris Total		**2**	**0.45%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.18%**

Table 81 cont. Frequency of butchering by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Surface		Transect 1		Total NISP	Total %
Species	Butchering Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Canis sp.																	
	Sliced	1	0.22%		0.00%		0.00%		0.00%	2	0.34%		0.00%		0.00%	3	0.27%
Canis sp. Total		**1**	**0.22%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.34%**		**0.00%**		**0.00%**	**3**	**0.27%**
Capra hircus																	
	Chopped	4	0.90%		0.00%		0.00%		0.00%	8	1.35%		0.00%		0.00%	12	1.09%
	Chopped and sliced	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	6	1.35%		0.00%		0.00%		0.00%	5	0.84%		0.00%		0.00%	11	1.00%
Capra hircus Total		**11**	**2.47%**		**0.00%**		**0.00%**		**0.00%**	**13**	**2.19%**		**0.00%**		**0.00%**	**24**	**2.18%**
Crocodilus niloticus																	
	Chopped		0.00%				0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
Crocodilus niloticus Total			**0.00%**		**0.00%**		**0.00%**		**0.00%**	**1**	**0.17%**		**0.00%**		**0.00%**	**1**	**0.09%**
Equus sp.																	
	Chopped		0.00%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
Equus sp. Total			**0.00%**		**0.00%**		**0.00%**		**0.00%**	**1**	**0.17%**		**0.00%**		**0.00%**	**1**	**0.09%**

Table 81 cont. Frequency of butchering by area.

Species	Butchering Type	Dung NISP	Dung %	Midden 1 NISP	Midden 1 %	Midden 2 NISP	Midden 2 %	Midden 3 NISP	Midden 3 %	Mound NISP	Mound %	Surface NISP	Surface %	Transect 1 NISP	Transect 1 %	Total NISP	Total %
Hippopotamus amphibius																	
	Chopped	1	0.22%		0.00%		0.00%		0.00%	12	20.04%		0.00%		0.00%	160	14.51%
	Chopped and sliced		0.00%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
	Sliced	2	0.45%		0.00%		0.00%		0.00%	2	0.34%		0.00%		0.00%	4	0.36%
Hippopotamus amphibius Total		**3**	**0.67%**		**0.00%**		**0.00%**		**0.00%**	**15**	**25.5%**		**0.00%**		**0.00%**	**222**	**20.13%**
Mammal-Large																	
	Chopped	22	4.94%	3	10.34%	2	10.00%	1	10.00%	25	4.22%		0.00%		0.00%	53	4.81%
	Impact fractures	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	25	5.62%	3	10.34%	2	10.00%	2	20.00%		0.00%		0.00%	2	40.00%	34	3.08%
Mammal-Large Total		**48**	**10.79%**	**6**	**20.69%**	**4**	**20.00%**	**3**	**30.00%**	**25**	**4.22%**		**0.00%**	**2**	**40.00%**	**88**	**7.98%**

Table 81 cont. Frequency of butchering by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Surface		Transect 1		Total NISP	Total %
Species	Butchering Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Mammal-Medium																	
	Chopped	8	1.80%	1	3.45%	6	30.00 %	2	20.00%		0.00%		0.00%		0.00%	17	1.54%
	Chopped and snapped	1	0.22%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.09%
	Sliced	38	8.54%	6	20.69%		0.00%	4	40.00%		0.00%		0.00%		0.00%	48	4.35%
Mammal-Medium Total		**47**	**10.56%**	**7**	**24.14%**	**6**	**30.00 %**	**6**	**60.00%**		**0.00%**		**0.00%**		**0.00%**	**66**	**5.98%**
Mammal-Very Large																	
	Chopped		0.00%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
	Sliced		0.00%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
Mammal-Very Large Total			**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.34%**		**0.00%**		**0.00%**	**2**	**0.18%**
Ovis aries																	
	Chopped	8	1.80%		0.00%		0.00%		0.00%	55	9.27%		0.00%		0.00%	63	5.71%
	Chopped and sliced	1	0.22%		0.00%		0.00%		0.00%	3	0.51%		0.00%		0.00%	4	0.36%
	Crushed		0.00%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
	Sliced	12	2.70%	1	3.45%		0.00%		0.00%	9	1.52%		0.00%		0.00%	22	1.99%
Ovis aries Total		**21**	**4.72%**	**1**	**3.45%**		**0.00%**		**0.00%**	**68**	**11.47%**		**0.00%**		**0.00%**	**90**	**8.16%**

Table 81 cont. Frequency of butchering by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Surface		Transect 1		Total NISP	Total %
Species	**Butchering Type**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Ovis/Capra																	
	Chopped	47	10.56%	2	6.90%		0.00%		0.00%	46	7.76%	1	100%		0.00%	96	8.70%
	Chopped and sliced	1	0.22%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	2	0.18%
	Sliced	48	10.79%	3	10.34%	1	5.00%		0.00%	3	0.51%		0.00%		0.00%	55	4.99%
Ovis/Capra Total		**96**	**21.57%**	**5**	**17.24%**	**1**	**5.00%**		**0.00%**	**50**	**8.43%**	**1**	**100%**		**0.00%**	**153**	**13.87%**
Sylvicapra grimmia																	
	Chopped		0.00%		0.00%		0.00%		0.00%	1	0.17%		0.00%		0.00%	1	0.09%
Sylvicapra grimmia Total			**0.00%**		**0.00%**		**0.00%**		**0.00%**	**1**	**0.17%**		**0.00%**		**0.00%**	**1**	**0.09%**
Grand Total		**445**	**100%**	**29**	**100%**	**20**	**100%**	**10**	**100%**	**386**	**100%**	**1**	**100%**	**5**	**100%**	**1103**	**100%**

Table 82. Butchering frequency by secure horizon.

		1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		5. Surface		Total NISP	Total %
Species	Butchering	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Bos taurus															
	Chopped	69	25.27%	54	12.44%	6	21.43%	3	18.75%	14	17.50%		0.00%	146	17.55%
	Chopped and sliced	3	1.10%	5	1.15%		0.00%		0.00%		0.00%		0.00%	8	0.96%
	Chopped and snapped	2	0.73%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.24%
	Impact fractures	1	0.37%	1	0.23%		0.00%		0.00%		0.00%		0.00%	2	0.24%
	Sliced	23	8.42%	25	5.76%	2	7.14%	3	18.75%	17	21.25%		0.00%	70	8.41%
Bos taurus Total		**98**	**35.90%**	**85**	**19.59%**	**8**	**28.57%**	**6**	**37.50%**	**31**	**38.75%**		**0.00%**	**228**	**27.40%**
Bovid Class 1															
	Chopped	2	0.73%	1	0.23%		0.00%		0.00%	1	1.25%		0.00%	4	0.48%
	Sliced	2	0.73%	5	1.15%		0.00%		0.00%		0.00%		0.00%	7	0.84%
Bovid Class 1 Total		**4**	**1.47%**	**6**	**1.38%**		**0.00%**		**0.00%**	**1**	**1.25%**		**0.00%**	**11**	**1.32%**
Bovid Class 2															
	Chopped	2	0.73%	9	2.07%		0.00%		0.00%	1	1.25%		0.00%	12	1.44%
	Chopped and sliced	1	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Scored around shaft		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	6	2.20%	9	2.07%		0.00%		0.00%	2	2.50%		0.00%	17	2.04%
Bovid Class 2 Total		**9**	**3.30%**	**19**	**4.38%**		**0.00%**		**0.00%**	**3**	**3.75%**		**0.00%**	**31**	**3.73%**
Bovid Class 2/3															
	Chopped		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
Bovid Class 2/3 Total			**0.00%**	**2**	**0.46%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.24%**

Table 82 cont. Butchering frequency by secure horizon.

		1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		5. Surface		Total NISP	Total %
Species	Butchering	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Bovid Class 3															
	Chopped	5	1.83%	20	4.61%	1	3.57%	1	6.25%	3	3.75%		0.00%	30	3.61%
	Chopped and sliced		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Chopped and snapped	1	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Impact fractures	1	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	7	2.56%	7	1.61%	1	3.57%		0.00%	5	6.25%		0.00%	20	2.40%
Bovid Class 3 Total		**14**	**5.13%**	**28**	**6.45%**	**2**	**7.14%**	**1**	**6.25%**	**8**	**10.00%**		**0.00%**	**53**	**6.37%**
Bovid Class 4															
	Chopped		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	1	0.37%	1	0.23%		0.00%		0.00%		0.00%		0.00%	2	0.24%
Bovid Class 4 Total		**1**	**0.37%**	**2**	**0.46%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**3**	**0.36%**
Canis familiaris															
	Chopped		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
Canis familiaris Total			**0.00%**	**2**	**0.46%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.24%**
Canis sp.															
	Sliced	1	0.37%	1	0.23%		0.00%		0.00%		0.00%		0.00%	2	0.24%
Canis sp. Total		**1**	**0.37%**	**1**	**0.23%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.24%**

Table 82 cont. Butchering frequency by secure horizon.

		1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		5. Surface		Total NISP	Total %
Species	**Butchering**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Capra hircus															
	Chopped	3	1.10%	5	1.15%		0.00%		0.00%	1	1.25%		0.00%	9	1.08%
	Chopped and sliced	1	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	4	1.47%	1	0.23%		0.00%	1	6.25%	2	2.50%		0.00%	8	0.96%
Capra hircus Total		**8**	**2.93%**	**6**	**1.38%**		**0.00%**	**1**	**6.25%**	**3**	**3.75%**		**0.00%**	**18**	**2.16%**
Hippopotamus amphibius															
	Chopped	10	3.66%	68	15.67%		0.00%	2	12.50%		0.00%		0.00%	80	9.62%
	Sawn		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	1	0.37%	1	0.23%		0.00%		0.00%		0.00%		0.00%	2	0.24%
Hippopotamus amphibius Total		**11**	**4.03%**	**70**	**16.13%**		**0.00%**	**2**	**12.50%**		**0.00%**		**0.00%**	**83**	**9.98%**
Loxodonta africana															
	Sliced		0.00%	68	15.67%		0.00%		0.00%		0.00%		0.00%	68	8.17%
Loxodonta africana Total			**0.00%**	**68**	**15.67%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**68**	**8.17%**
Mammal-Large															
	Chopped	9	3.30%	10	2.30%	3	10.71%	2	12.50%	5	6.25%		0.00%	29	3.49%
	Sliced	7	2.56%	11	2.53%	3	10.71%		0.00%	4	5.00%		0.00%	25	3.00%
Mammal-Large Total		**16**	**5.86%**	**21**	**4.84%**	**6**	**21.43%**	**2**	**12.50%**	**9**	**11.25%**		**0.00%**	**54**	**6.49%**
Mammal-Medium															
	Chopped	5	1.83%	10	2.30%	1	3.57%		0.00%	1	1.25%		0.00%	17	2.04%
	Chopped and snapped	1	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	10	3.66%	25	5.76%	4	14.29%		0.00%	4	5.00%		0.00%	43	5.17%
Mammal-Medium Total		**16**	**5.86%**	**35**	**8.06%**	**5**	**17.86%**		**0.00%**	**5**	**6.25%**		**0.00%**	**61**	**7.33%**

Table 82 cont. Butchering frequency by secure horizon.

		1. Lower		2. Middle		3a. Upper		3b. Upper		4. Plough		5. Surface		Total NISP	Total %
Species	**Butchering**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Mammal-Very Large															
	Chopped		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
Mammal-Very Large Total			**0.00%**	**2**	**0.46%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**2**	**0.24%**
Ovis aries															
	Chopped	29	10.62%	18	4.15%		0.00%	1	6.25%	2	2.50%		0.00%	50	6.01%
	Chopped and sliced	2	0.73%	2	0.46%		0.00%		0.00%		0.00%		0.00%	4	0.48%
	Crushed	1	0.37%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.12%
	Sliced	4	1.47%	8	1.84%	1	3.57%		0.00%	2	2.50%		0.00%	15	1.80%
Ovis aries Total		**36**	**13.19%**	**28**	**6.45%**	**1**	**3.57%**	**1**	**6.25%**	**4**	**5.00%**		**0.00%**	**70**	**8.41%**
Ovis/Capra															
	Chopped	41	15.02%	37	8.53%	2	7.14%	3	18.75%	7	8.75%	1	100.00%	91	10.94%
	Chopped and sliced	1	0.37%		0.00%		0.00%		0.00%	1	1.25%		0.00%	2	0.24%
	Sliced	17	6.23%	21	4.84%	4	14.29%		0.00%	8	10.00%		0.00%	50	6.01%
Ovis/Capra Total		**59**	**21.61%**	**58**	**13.36%**	**6**	**21.43%**	**3**	**18.75%**	**16**	**20.00%**	**1**	**100.00%**	**143**	**17.19%**
Sylvicapra grimmia															
	Chopped		0.00%	1	0.23%		0.00%		0.00%		0.00%		0.00%	1	0.12%
Sylvicapra grimmia Total			**0.00%**	**1**	**0.23%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**1**	**0.12%**
Grand Total		**273**	**100%**	**434**	**100%**	**28**	**100%**	**16**	**100%**	**80**	**100%**	**1**	**100%**	**832**	**100%**

Table 82b Frequency of butchery by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Surface		Transect 1		Transect 2		Total NISP	Total %
Butchering	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Chopped	185	0.86%	14	0.80%	14	0.79%	3	0.07%	411	2.44%	1	4.17%	1	0.15%		0.00%	629	1.34%
Chopped and sawed		0.00%		0.00%		0.00%		0.00%	55	0.33%		0.00%		0.00%		0.00%	55	0.12%
Chopped and sliced	10	0.05%		0.00%		0.00%		0.00%	8	0.05%		0.00%	1	0.15%		0.00%	19	0.04%
Chopped and snapped	4	0.02%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.01%
Crushed		0.00%		0.00%		0.00%		0.00%	1	0.01%		0.00%		0.00%		0.00%	1	0.00%
Impact fractures	4	0.02%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	4	0.01%
Sawn		0.00%		0.00%		0.00%		0.00%	2	0.01%		0.00%		0.00%		0.00%	2	0.00%
Scored around shaft	1	0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.00%
Sliced	241	1.12%	15	0.86%	6	0.34%	7	0.17%	116	0.69%		0.00%	3	0.44%		0.00%	388	0.83%
(blank)	21092	97.93%	1718	98.34%	1760	98.88%	4043	99.75%	16267	96.48%	23	95.83%	682	99.27%	319	100%	45904	97.65%
Grand Total	**21537**	**100%**	**1747**	**100%**	**1780**	**100%**	**4053**	**100%**	**16860**	**100%**	**24**	**100%**	**687**	**100%**	**319**	**100%**	**47007**	**100%**

Table 82c. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Bos taurus				
	Chopped			
		Astragalus	5	0.45%
		Calcaneous	3	0.27%
		Cranium	2	0.18%
		Femur	6	0.54%
		Humerus	11	1.00%
		Innominate	11	1.00%
		Mandible	1	0.09%
		Metacarpal	5	0.45%
		Metapodial	9	0.82%
		Metatarsal	9	0.82%
		Phalanx	49	4.44%
		Radius	5	0.45%
		Radius, ulna	2	0.18%
		Rib	8	0.73%
		Scapula	4	0.36%
		Sesamoid	1	0.09%
		Tarsal	4	0.36%
		Tibia	5	0.45%
		Ulna	1	0.09%
		Vertebra	30	2.72%
	Chopped Total		**171**	**15.50%**
	Chopped and sliced			
		Astragalus	1	0.09%
		Cranium	1	0.09%
		Mandible	1	0.09%
		Metatarsal	3	0.27%
		Rib	1	0.09%
		Tarsal	2	0.18%
	Chopped and sliced Total		**9**	**0.82%**
	Chopped and snapped			
		Cranium	1	0.09%
		Rib	1	0.09%
	Chopped and snapped Total		**2**	**0.18%**
	Impact fractures			
		Metacarpal	1	0.09%
		Phalanx	1	0.09%
	Impact fractures Total		**2**	**0.18%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
	Sliced			
		Astragalus	3	0.27%
		Calcaneous	4	0.36%
		Carpal	4	0.36%
		Cranium	2	0.18%
		Femur	4	0.36%
		Humerus	3	0.27%
		Hyoid	1	0.09%
		Innominate	6	0.54%
		Mandible	6	0.54%
		Mandible with teeth	3	0.27%
		Metacarpal	7	0.63%
		Metatarsal	8	0.73%
		Phalanx	5	0.45%
		Radius	1	0.09%
		Rib	9	0.82%
		Scapula	4	0.36%
		Tarsal	8	0.73%
		Tibia	3	0.27%
		Ulna	1	0.09%
		Vertebra	3	0.27%
	Sliced Total		**85**	**7.71%**
Bos taurus Total			**269**	**24.39%**
Bovid Class 1				
	Chopped			
		Femur	1	0.09%
		Metacarpal	1	0.09%
		Scapula	1	0.09%
		Vertebra	1	0.09%
	Chopped Total		**4**	**0.36%**
	Sliced			
		Innominate	1	0.09%
		Mandible	1	0.09%
		Metatarsal	3	0.27%
		Rib	3	0.27%
	Sliced Total		**8**	**0.73%**
Bovid Class 1 Total			**12**	**1.09%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Bovid Class 2				
	Chopped			
		Humerus	2	0.18%
		Innominate	1	0.09%
		Rib	1	0.09%
		Tarsal	1	0.09%
		Vertebra	7	0.63%
	Chopped Total		**12**	**1.09%**
	Chopped and sliced			
		Rib	1	0.09%
	Chopped and sliced Total		**1**	**0.09%**
	Scored around shaft			
		Rib	1	0.09%
	Scored around shaft Total		**1**	**0.09%**
	Sliced			
		Femur	1	0.09%
		Humerus	1	0.09%
		Metatarsal	1	0.09%
		Rib	18	1.63%
		Scapula	1	0.09%
		Tibia	2	0.18%
		Vertebra	1	0.09%
	Sliced Total		**25**	**2.27%**
Bovid Class 2 Total			**39**	**3.54%**
Bovid Class 2/3				
	Chopped			
		Vertebra	1	0.09%
	Chopped Total		**1**	**0.09%**
	Sliced			
		Rib	1	0.09%
	Sliced Total		**1**	**0.09%**
Bovid Class 2/3 Total			**2**	**0.18%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Bovid Class 3				
	Chopped			
		Femur	1	0.09%
		Humerus	2	0.18%
		Metacarpal	1	0.09%
		Metapodial	6	0.54%
		Metatarsal	1	0.09%
		Phalanx	2	0.18%
		Rib	3	0.27%
		Scapula	1	0.09%
		Tibia	1	0.09%
		Ulna	1	0.09%
		Vertebra	13	1.18%
	Chopped Total		**32**	**2.90%**
	Chopped and sliced			
		Astragalus	1	0.09%
	Chopped and sliced Total		**1**	**0.09%**
	Chopped and snapped			
		Rib	1	0.09%
	Chopped and snapped Total		**1**	**0.09%**
	Impact fractures			
		Femur	1	0.09%
	Impact fractures Total		**1**	**0.09%**
	Sliced			
		Calcaneous	1	0.09%
		Humerus	1	0.09%
		Innominate	2	0.18%
		Long bone	1	0.09%
		Metatarsal	1	0.09%
		Radius	1	0.09%
		Rib	7	0.63%
		Unidentifiable	1	0.09%
		Vertebra	5	0.45%
	Sliced Total		**20**	**1.81%**
Bovid Class 3 Total			**55**	**4.99%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Bovid Class 4				
	Chopped			
		Metatarsal	1	0.09%
		Unidentifiable	2	0.18%
	Chopped Total		**3**	**0.27%**
	Sliced			
		Rib	2	0.18%
	Sliced Total		**2**	**0.18%**
Bovid Class 4 Total			**5**	**0.45%**
Canis familiaris				
	Chopped			
		Mandible with teeth	1	0.09%
	Chopped Total		**1**	**0.09%**
	Sliced			
		Mandible with teeth	1	0.09%
	Sliced Total		**1**	**0.09%**
Canis familiaris Total			**2**	**0.18%**
Canis sp.				
	Sliced			
		Astragalus	1	0.09%
		Tibia	1	0.09%
		Ulna	1	0.09%
	Sliced Total		**3**	**0.27%**
Canis sp. Total			**3**	**0.27%**
Capra hircus				
	Chopped			
		Cranium	2	0.18%
		Innominate	3	0.27%
		Metacarpal	1	0.09%
		Phalanx	3	0.27%
		Vertebra	3	0.27%
	Chopped Total		**12**	**1.09%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Capra hircus	Chopped and sliced			
		Vertebra	1	0.09%
	Chopped and sliced Total		**1**	**0.09%**
	Sliced			
		Astragalus	1	0.09%
		Calcaneous	1	0.09%
		Cranium	1	0.09%
		Innominate	4	0.36%
		Mandible with teeth	1	0.09%
		Phalanx	1	0.09%
		Radius	2	0.18%
	Sliced Total		**11**	**1.00%**
Capra hircus Total			**24**	**2.18%**
Crocodilus niloticus				
	Chopped			
		Cranium	1	0.09%
	Chopped Total		**1**	**0.09%**
Crocodilus niloticus Total			**1**	**0.09%**
Equus sp.				
	Chopped			
		Humerus	1	0.09%
	Chopped Total		**1**	**0.09%**
Equus sp. Total			**1**	**0.09%**
Hippopotamus amphibius				
	Chopped			
		Carpal/tarsal	1	0.09%
		Femur	1	0.09%
		Innominate	1	0.09%
		Long bone	1	0.09%
		Loose tooth	145	13.15%
		Mandible	1	0.09%
		Phalanx	1	0.09%
		Rib	2	0.18%
		Tibia	3	0.27%
		Ulna	1	0.09%
		Unidentifiable	1	0.09%
		Vertebra	2	0.18%
	Chopped Total		**160**	**14.51%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Hippopotamus amphibius	**Chopped and sawed**			
		Loose tooth	55	4.99%
	Chopped and sawed Total		**55**	**4.99%**
	Chopped and sliced			
		Rib	1	0.09%
	Chopped and sliced Total		**1**	**0.09%**
	Sawn			
		Loose tooth	2	0.18%
	Sawn Total		**2**	**0.18%**
	Sliced			
		Astragalus	2	0.18%
		Loose tooth	1	0.09%
		Metapodial	1	0.09%
	Sliced Total		**4**	**0.36%**
Hippopotamus amphibius Total			**222**	**20.13%**
Loxodonta africana				
	Sliced			
		Loose tooth	68	6.17%
	Sliced Total		**68**	**6.17%**
Loxodonta africana Total			**68**	**6.17%**
Mammal-Large				
	Chopped			
		Femur	2	0.18%
		Humerus	1	0.09%
		Innominate	1	0.09%
		Long bone	4	0.36%
		Metacarpal	1	0.09%
		Metapodial	2	0.18%
		Phalanx	1	0.09%
		Rib	12	1.09%
		Scapula	1	0.09%
		Unidentifiable	22	1.99%
		Vertebra	6	0.54%
	Chopped Total		**53**	**4.81%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Mammal-Large	Impact fractures			
		Tibia	1	0.09%
	Impact fractures Total		**1**	**0.09%**
	Sliced			
		Femur	1	0.09%
		Flat bone	4	0.36%
		Long bone	8	0.73%
		Mandible	1	0.09%
		Metacarpal	1	0.09%
		Rib	16	1.45%
		Tarsal	1	0.09%
		Unidentifiable	1	0.09%
		Vertebra	1	0.09%
	Sliced Total		**34**	**3.08%**
Mammal-Large Total			**88**	**7.98%**
Mammal-Medium				
	Chopped			
		Humerus	1	0.09%
		Innominate	2	0.18%
		Long bone	3	0.27%
		Rib	2	0.18%
		Vertebra	9	0.82%
	Chopped Total		**17**	**1.54%**
	Chopped and snapped			
		Radius	1	0.09%
	Chopped and snapped Total		**1**	**0.09%**
	Sliced			
		Costal Cartilage	1	0.09%
		Cranium	1	0.09%
		Femur	1	0.09%
		Flat bone	3	0.27%
		Long bone	6	0.54%
		Rib	34	3.08%
		Scapula	1	0.09%
		Vertebra	1	0.09%
	Sliced Total		**48**	**4.35%**
Mammal-Medium Total			**66**	**5.98%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Mammal-Very Large				
	Chopped			
		Vertebra	1	0.09%
	Chopped Total		**1**	**0.09%**
	Sliced			
		Long bone	1	0.09%
	Sliced Total		**1**	**0.09%**
Mammal-Very Large Total			**2**	**0.18%**
Ovis aries				
	Chopped			
		Astragalus	1	0.09%
		Calcaneous	2	0.18%
		Cranium	17	1.54%
		Femur	3	0.27%
		Humerus	4	0.36%
		Innominate	9	0.82%
		Metatarsal	2	0.18%
		Phalanx	1	0.09%
		Radius	1	0.09%
		Scapula	10	0.91%
		Tibia	1	0.09%
		Vertebra	12	1.09%
	Chopped Total		**63**	**5.71%**
	Chopped and sliced			
		Cranium	2	0.18%
		Innominate	1	0.09%
		Scapula	1	0.09%
	Chopped and sliced Total		**4**	**0.36%**
	Crushed			
		Scapula	1	0.09%
	Crushed Total		**1**	**0.09%**
	Sliced			
		Astragalus	1	0.09%
		Calcaneous	1	0.09%
		Femur	2	0.18%
		Humerus	2	0.18%

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Ovis aries		Innominate	4	0.36%
		Mandible with teeth	1	0.09%
		Metatarsal	3	0.27%
		Phalanx	2	0.18%
		Radius	1	0.09%
		Scapula	5	0.45%
	Sliced Total		**22**	**1.99%**
Ovis aries Total			**90**	**8.16%**
Ovis/Capra				
	Chopped			
		Calcaneous	1	0.09%
		Cranium	7	0.63%
		Femur	8	0.73%
		Humerus	5	0.45%
		Innominate	7	0.63%
		Metacarpal	4	0.36%
		Metapodial	2	0.18%
		Metatarsal	3	0.27%
		Phalanx	10	0.91%
		Rib	3	0.27%
		Ulna	2	0.18%
		Vertebra	44	3.99%
	Chopped Total		**96**	**8.70%**
	Chopped and sliced			
		Innominate	2	0.18%
	Chopped and sliced Total		**2**	**0.18%**
	Sliced			
		Astragalus	1	0.09%
		Femur	1	0.09%
		Humerus	4	0.36%
		Innominate	4	0.36%
		Mandible with teeth	1	0.09%
		Phalanx	1	0.09%
		Radius	1	0.09%
		Rib	27	2.45%
		Scapula	1	0.09%
		Tarsal	4	0.36%
		Tibia	2	0.18%
		Vertebra	8	0.73%
	Sliced Total		**55**	**4.99%**
Ovis/Capra Total			**153**	**13.87%**

Table 82c cont. Frequency of butchering by species and element type.

Species	Butchering	Element Type	NISP	%
Sylvicapra grimmia				
	Chopped			
		Astragalus	1	0.09%
	Chopped Total		**1**	**0.09%**
Sylvicapra grimmia Total			**1**	**0.09%**
Grand Total			**1103**	**100.00%**

Table 84. Burning by area.

Level of Burning	Species	Dung NISP	Dung %	Midden 1 NISP	Midden 1 %	Midden 2 NISP	Midden 2 %	Midden 3 NISP	Midden 3 %	Mound NISP	Mound %	Transect 1 NISP	Transect 1 %	Transect 2 NISP	Transect 2 %	Total NISP	Total %
0.5 Tan																	
	Bovid Class 2	1	0.07%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
	Bovid Class 3		0.00%	1	0.75%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
	Mammal-Medium	5	0.37%	1	0.75%		0.00%		0.00%		0.00%		0.00%		0.00%	6	0.23%
0.5 Tan Total		**6**	**0.45%**	**2**	**1.49%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**8**	**0.30%**
1. Burned																	
	Bos taurus	2	0.15%		0.00%		0.00%		0.00%	16	2.95%		0.00%		0.00%	18	0.68%
	Bovid Class 1	5	0.37%		0.00%		0.00%		0.00%	5	0.92%		0.00%		0.00%	10	0.38%
	Bovid Class 2		0.00%		0.00%		0.00%		0.00%	9	1.66%		0.00%		0.00%	9	0.34%
	Bovid Class 3		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Canis familiaris		0.00%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	2	0.08%
	Canis mesomelas		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Capra hircus		0.00%		0.00%		0.00%		0.00%	4	0.74%		0.00%		0.00%	4	0.15%
	Hippopotamus amphibius		0.00%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	2	0.08%
	Mammal-Large	10	0.74%		0.00%		0.00%		0.00%	3	0.55%		0.00%		0.00%	13	0.49%
	Mammal-Medium	52	3.86%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	52	1.97%

Table 83 cont. Burning by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Level of Burning	**Species**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
	Mammal-Unidentifiable	12	0.89%		0.00%	1	1.14%		0.00%	215	39.59%		0.00%		0.00%	228	8.63%
	Ovis aries	2	0.15%		0.00%		0.00%		0.00%	7	1.29%		0.00%		0.00%	9	0.34%
	Ovis/Capra	10	0.74%		0.00%		0.00%		0.00%	51	9.39%		0.00%		0.00%	61	2.31%
	Tortoise		0.00%		0.00%		0.00%		0.00%	3	0.55%		0.00%		0.00%	3	0.11%
	Varanus sp.	**93**	0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
1. Burned Total			**6.90%**		**0.00%**	**1**	**1.14 %**		**0.00%**	**320**	**58.93%**		**0.00%**		**0.00%**	**414**	**15.67 %**

Table 84 cont. Burning by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Level of Burning	Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
1.5 Red																	
	Bos taurus	3	0.22%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	4	0.15%
	Bovid Class 2		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Bovid Class 3	1	0.07%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
	Capra hircus		0.00%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	2	0.08%
	Mammal-Large	14	1.04%		0.00%	1	1.14%	1	0.21%	2	0.37%		0.00%		0.00%	18	0.68%
	Mammal-Medium	33	2.45%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	33	1.25%
	Ovis aries	2	0.15%		0.00%	1	1.14%		0.00%	8	1.47%		0.00%		0.00%	11	0.42%
	Ovis/Capra	6	0.45%		0.00%	1	1.14%		0.00%	3	0.55%		0.00%		0.00%	10	0.38%
1.5 Red Total		**59**	**4.38%**		**0.00%**	**3**	**3.41%**	**1**	**0.21%**	**17**	**3.13%**		**0.00%**		**0.00%**	**80**	**3.03%**
2. Grey																	
	Aepyceros melampus	1	0.07%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
	Bos taurus	9	0.67%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	9	0.34%
	Bovid Class 1	1	0.07%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
	Bovid Class 2	11	0.82%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	13	0.49%
	Bovid Class 3	13	0.97%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	13	0.49%
	Canis familiaris	2	0.15%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.08%
	Canis sp.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Capra hircus	4	0.30%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	6	0.23%
	Mammal-Large	28	2.08%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	28	1.06%
	Mammal-Medium	32	2.38%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	32	1.21%

Table 84 cont. Burning by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Level of Burning	Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Grey	Mammal-Unidentifiable	8	0.59%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	8	0.30%
	Ovis aries	7	0.52%		0.00%		0.00%		0.00%	3	0.55%		0.00%		0.00%	10	0.38%
	Ovis/Capra	26	1.93%		0.00%		0.00%		0.00%	7	1.29%		0.00%		0.00%	33	1.25%
	Unionidae	2	0.15%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.08%
	Canis familiaris cf.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
2. Grey Total		**144**	**10.69%**		**0.00%**		**0.00%**		**0.00%**	**16**	**2.95%**		**0.00%**		**0.00%**	**160**	**6.06%**
2.5 Blue																	
Mammal-Medium			0.00%	1	0.75%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
2.5 Blue Total			**0.00%**	**1**	**0.75%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**	**1**	**0.04%**
3. Black																	
	Achatina sp.		0.00%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	2	0.08%
	Anas undulata		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Aves sp.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Bos taurus	30	2.23%	1	0.75%	1	1.14%		0.00%	20	3.68%		0.00%		0.00%	52	1.97%
	Bovid Class 1	2	0.15%	1	0.75%		0.00%		0.00%	4	0.74%		0.00%		0.00%	7	0.26%
	Bovid Class 2	2	0.15%		0.00%		0.00%	2	0.41%	5	0.92%		0.00%		0.00%	9	0.34%
	Bovid Class 3		0.00%		0.00%		0.00%		0.00%	1	0.18%	1	3.23%		0.00%	2	0.08%
	Canis sp.		0.00%		0.00%		0.00%		0.00%	3	0.55%		0.00%		0.00%	3	0.11%
	Capra hircus	5	0.37%		0.00%		0.00%		0.00%	11	2.03%		0.00%		0.00%	16	0.61%
	Equus sp.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Felis sp.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	

Table 834 cont. Burning by area.

		Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Transect 2		Total NISP	Total %
Level of Burning	Species	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
	Fish-Unidentifiable		0.00%		0.00%		0.00%		0.00%	3	0.55%		0.00%		0.00%	3	0.11%
	Gallus domesticus	1	0.07%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.04%
	Gallus domesticus cf.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Hippopotamus amphibius		0.00%		0.00%		0.00%		0.00%	3	0.55%		0.00%		0.00%	3	0.11%
	Mammal-Large	156	11.58%	21	15.67%	32	36.36%	18	3.71%	10	1.84%	15	48.39%		0.00%	252	9.54%
	Mammal-Medium	304	22.57%	48	35.82%	31	35.23%	35	7.22%	6	1.10%	2	6.45%	1	7.14%	427	16.16%
	Mammal-Small	1	0.07%	1	0.75%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.08%
	Mammal-Unidentifiable	386	28.66%	19	14.18%	9	10.23%	186	38.35%	3	0.55%	6	19.35%		0.00%	609	23.05%
	Mammal-Very Large		0.00%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	2	0.08%
	Ovis aries	12	0.89%		0.00%	1	1.14%		0.00%	26	4.79%		0.00%		0.00%	39	1.48%
	Ovis/Capra	48	3.56%	5	3.73%	3	3.41%	1	0.21%	59	10.87%		0.00%		0.00%	116	4.39%
	Raphicerus sp.		0.00%		0.00%		0.00%		0.00%	2	0.37%		0.00%		0.00%	2	0.08%
	Reptile-Unidentifiable		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Sylvicapra grimmia		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
	Canis familiaris cf.		0.00%		0.00%		0.00%		0.00%	1	0.18%		0.00%		0.00%	1	0.04%
3. Black Total		**947**	**70.30%**	**96**	**71.64%**	**77**	**87.50%**	**242**	**49.90%**	**168**	**30.94%**	**24**	**77.42%**	**1**	**7.14%**	**1555**	**58.86%**

Table 84. Levels of burning by secure horizon.

	1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		Total NISP	Total %
Level of Burning	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
0.5 Tan		0.00%	1	0.07%		0.00%	1	0.80%		0.00%		0.00%	2	0.08%
1. Burned	66	10.43%	119	8.35%		0.00%	20	16.00%		0.00%	129	56.33%	334	13.81%
1.5 Red		0.00%	55	3.86%		0.00%	3	2.40%		0.00%	6	2.62%	64	2.65%
2. Grey	107	16.90%	34	2.39%		0.00%		0.00%	1	16.67%		0.00%	142	5.87%
2.5 Blue		0.00%	1	0.07%		0.00%		0.00%		0.00%		0.00%	1	0.04%
3. Black	415	65.56%	892	62.60%		0.00%	74	59.20%	4	66.67%	80	34.93%	1465	60.56%
4. White	45	7.11%	323	22.67%	1	100.00%	27	21.60%	1	16.67%	14	6.11%	411	16.99%
Grand Total	**633**	**100.00%**	**1425**	**100.00%**	**1**	**100.00%**	**125**	**100.00%**	**6**	**100.00%**	**229**	**100.00%**	**2419**	**100.00%**

Table 85. Weathering frequency by area.

	0. No weathering		1. Light		2. Moderate		3. Heavy		Total NISP	Total %
Site Area	NISP	%	NISP	%	NISP	%	NISP	%		
Dung		0.00%	4286	21.91%	7866	40.21%	7411	37.88%	19563	100.00%
Midden 1		0.00%	83	4.93%	1121	66.53%	481	28.55%	1685	100.00%
Midden 2		0.00%	28	1.57%	1057	59.45%	693	38.98%	1778	100.00%
Midden 3		0.00%	4	0.10%	389	9.56%	3674	90.34%	4067	100.00%
Mound	*295	2.18%	3165	23.35%	2429	17.92%	7667	56.56%	13556	100.00%
Surface		0.00%	1	4.17%	6	25.00%	17	70.83%	24	100.00%
Transect 1		0.00%	6	0.87%	424	61.72%	257	37.41%	687	100.00%
Transect 2		0.00%		0.00%	20	6.27%	299	93.73%	319	100.00%
Grand Total	***295**	**0.71%**	**7573**	**18.17%**	**13312**	**31.94%**	**20499**	**49.18%**	**41679**	**100.00%**

***Majority of no weathering elements in Mound Area is due to intrusive rodent.**

Table 86. Weathering levels by secure horizon.

	1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough		5. Surface		Total NISP	Total %
Weathering	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
0. No weathering	50	0.60%	176	0.94%		0.00%		0.00%		0.00%	16	0.21%		0.00%	242	0.66%
1. Light	1337	15.95%	3774	20.16%		0.00%	378	25.75%	234	67.83%	388	5.08%	1	4.17%	6112	16.70%
2. Moderate	3439	41.03%	6001	32.06%	1	5.56%	726	49.46%	104	30.14%	1301	17.04%	6	25.00%	11578	31.64%
3. Heavy	3556	42.42%	8767	46.84%	17	94.44%	364	24.80%	7	2.03%	5928	77.66%	17	70.83%	18656	50.99%
Grand Total	**8382**	**100%**	**18718**	**100%**	**18**	**100%**	**1468**	**100%**	**345**	**100%**	**7633**	**100%**	**24**	**100%**	**36588**	**100%**

Table 87. Frequency and type of gnawing present at Ndondondwane by area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Transect 1		Total NISP	Total %
Gnawing Type	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Canid and rodent gnawing		0.00%		0.00%		0.00%		0.00%	6	1.15%		0.00%	6	0.62%
Canid gnawing		0.00%		0.00%		0.00%		0.00%	37	7.06%		0.00%	37	3.83%
Canid-heavy	8	2.05%	2	16.67%	4	40.00%		0.00%	5	0.95%	1	12.50%	20	2.07%
Canid-medium	31	7.93%	1	8.33%	1	10.00%	2	9.52%	14	2.67%	1	12.50%	50	5.18%
Canid-medium, rodent-slight	1	0.26%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.10%
Canid-slight	51	13.04%	3	25.00%	2	20.00%	5	23.81%	30	5.73%	1	12.50%	92	9.52%
Canid-slight; rodent-heavy	1	0.26%		0.00%		0.00%		0.00%		0.00%		0.00%	1	0.10%
Canid-slight, rodent-medium	2	0.51%	1	8.33%		0.00%		0.00%	2	0.38%		0.00%	5	0.52%
Canid-slight, rodent-slight	2	0.51%		0.00%		0.00%		0.00%	1	0.19%		0.00%	3	0.31%
Rodent gnawing	1	0.26%		0.00%		0.00%		0.00%	272	51.91%		0.00%	273	28.26%
Rodent-heavy	50	12.79%	1	8.33%		0.00%	3	14.29%	46	8.78%	4	50.00%	104	10.77%
Rodent-medium	101	25.83%	2	16.67%	2	20.00%	8	38.10%	82	15.65%	1	12.50%	196	20.29%
Rodent-slight	143	36.57%	2	16.67%	1	10.00%	3	14.29%	29	5.53%		0.00%	178	18.43%
Grand Total	**391**	**100%**	**12**	**100%**	**10**	**100%**	**21**	**100%**	**524**	**100%**	**8**	**100.00%**	**966**	**100.00%**

Table 88. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
Domestic				
	Bos taurus			
		Canid-heavy	12	1.24%
		Canid-medium	15	1.55%
		Canid-slight	34	3.52%
		Canid-slight, rodent-medium	2	0.21%
		Canid-slight, rodent-slight	2	0.21%
		Rodent-heavy	20	2.07%
		Rodent-medium	36	3.73%
		Rodent-slight	84	8.70%
		Canid-slight, rodent-heavy	1	0.10%
		Rodent	88	9.11%
		Canid	18	1.86%
		Canid and rodent	4	0.41%
	Bos taurus Total		**316**	**32.71%**
	Canis familiaris			
		Rodent-slight	1	0.10%
		Rodent	3	0.31%
	Canis familiaris Total		**4**	**0.41%**
	Capra hircus			
		Canid-medium	2	0.21%
		Canid-slight	8	0.83%
		Rodent-heavy	4	0.41%
		Rodent-medium	13	1.35%
		Rodent-slight	6	0.62%
		Rodent	5	0.52%
		Canid	1	0.10%
	Capra hircus Total		**39**	**4.04%**
	Ovis aries			
		Canid-heavy	1	0.10%
		Canid-medium	4	0.41%
		Canid-slight	9	0.93%
		Canid-slight, rodent-medium	1	0.10%
		Rodent-heavy	11	1.14%
		Rodent-medium	32	3.31%
		Rodent-slight	19	1.97%
		Rodent	42	4.35%
		Canid	4	0.41%
	Ovis aries Total		**123**	**12.73%**

Table 89 cont. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
	Ovis/Capra			
		Canid-medium	10	1.04%
		Canid-slight	10	1.04%
		Rodent-heavy	25	2.59%
		Rodent-medium	50	5.18%
		Rodent-slight	34	3.52%
		Rodent	103	10.66%
		Canid	10	1.04%
		Canid and rodent	2	0.21%
	Ovis/Capra Total		**244**	**25.26%**
Domestic Total			**726**	**75.16%**
Unknown				
	Mammal-Large			
		Canid-heavy	3	0.31%
		Canid-medium	8	0.83%
		Canid-slight	8	0.83%
		Rodent-heavy	6	0.62%
		Rodent-medium	9	0.93%
		Rodent-slight	16	1.66%
	Mammal-Large Total		**50**	**5.18%**
	Mammal-Medium			
		Canid-heavy	3	0.31%
		Canid-medium	2	0.21%
		Canid-slight	6	0.62%
		Rodent-heavy	25	2.59%
		Rodent-medium	37	3.83%
		Rodent-slight	9	0.93%
	Mammal-Medium Total		**82**	**8.49%**
	Mammal-Small			
		Rodent-medium	1	0.10%
	Mammal-Small Total		**1**	**0.10%**
	Mammal-Unidentifiable			
		Canid-slight, rodent-medium	1	0.10%
		Rodent-heavy	2	0.21%
		Rodent-slight	1	0.10%
	Mammal-Unidentifiable Total		**4**	**0.41%**
Unknown Total			**137**	**14.18%**

Table 89 cont. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
Wild				
	Aepyceros melampus			
		Rodent-medium	1	0.10%
	Aepyceros melampus Total		**1**	**0.10%**
	Bovid Class 1			
		Canid-slight	2	0.21%
		Rodent	1	0.10%
	Bovid Class 1 Total		**3**	**0.31%**
	Bovid Class 2			
		Canid-slight, rodent-slight	1	0.10%
		Rodent-heavy	1	0.10%
		Rodent-medium	3	0.31%
		Rodent-slight	2	0.21%
	Bovid Class 2 Total		**7**	**0.72%**
	Bovid Class 3			
		Rodent-heavy	2	0.21%
		Rodent-medium	4	0.41%
		Rodent-slight	1	0.10%
	Bovid Class 3 Total		**7**	**0.72%**
	Cercopithecus pygerythus			
		Rodent	1	0.10%
	Cercopithecus pygerythus Total		**1**	**0.10%**
	Crocodilus niloticus			
		Rodent	1	0.10%
	Crocodilus niloticus Total		**1**	**0.10%**
	Equus sp.			
		Rodent	1	0.10%
	Equus sp. Total		**1**	**0.10%**
	Francolinus swainsonii			
		Rodent	1	0.10%
	Francolinus swainsonii Total		**1**	**0.10%**

Table 89 cont. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
	Hippopotamus amphibius			
		Canid-medium	6	0.62%
		Canid-slight	7	0.72%
		Rodent	3	0.31%
		Canid	1	0.10%
	Hippopotamus amphibius Total		**17**	**1.76%**
	Lepus sp.			
		Rodent-heavy	1	0.10%
		Rodent-slight	1	0.10%
	Lepus sp. Total		**2**	**0.21%**
	Mammal-Very Large			
		Canid-slight	1	0.10%
	Mammal-Very Large Total		**1**	**0.10%**
	Numida meleagris			
		Rodent	2	0.21%
	Numida meleagris Total		**2**	**0.21%**
	Suid sp.			
		Rodent-slight	1	0.10%
		Rodent	1	0.10%
	Suid sp. Total		**2**	**0.21%**
	Sylvicapra grimmia			
		Rodent-heavy	1	0.10%
		Rodent-medium	2	0.21%
		Rodent	2	0.21%
		Canid	1	0.10%
	Sylvicapra grimmia Total		**6**	**0.62%**
	Tragelaphus angasi			
		Rodent	2	0.21%
	Tragelaphus angasi Total		**2**	**0.21%**
	Varanus sp.			
		Rodent-heavy	1	0.10%
		Rodent-medium	1	0.10%
	Varanus sp. Total		**2**	**0.21%**
Wild Total			**56**	**5.80%**

Table 89 cont. Frequency and type of gnawing by species.

Domestication Wild?	Species	Gnawing Type	NISP	%
	Bovid Class 1			
		Canid-slight	2	0.21%
		Rodent-slight	2	0.21%
		Rodent	3	0.31%
	Bovid Class 1 Total		**7**	**0.72%**
	Bovid Class 2			
		Canid-medium	2	0.21%
		Canid-slight	2	0.21%
		Canid-slight, rodent-medium	1	0.10%
		Rodent-heavy	3	0.31%
		Rodent-medium	1	0.10%
		Rodent-slight	1	0.10%
		Rodent	10	1.04%
	Bovid Class 2 Total		**20**	**2.07%**
	Bovid Class 3			
		Canid-heavy	1	0.10%
		Canid-medium	1	0.10%
		Canid-medium, rodent-slight	1	0.10%
		Canid-slight	3	0.31%
		Rodent-heavy	1	0.10%
		Rodent-medium	5	0.52%
		Rodent	4	0.41%
		Canid	2	0.21%
	Bovid Class 3 Total		**18**	**1.86%**
	Canis sp.			
		Rodent-heavy	1	0.10%
		Rodent-medium	1	0.10%
	Canis sp. Total		**2**	**0.21%**
Wild? Total			**47**	**4.87%**
-				
Grand Total			**966**	**100.00%**

Table 89. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
Domestic				
	Bos taurus			
		Canid-heavy	12	1.24%
		Canid-medium	15	1.55%
		Canid-slight	34	3.52%
		Canid-slight, rodent-medium	2	0.21%
		Canid-slight, rodent-slight	2	0.21%
		Rodent-heavy	20	2.07%
		Rodent-medium	36	3.73%
		Rodent-slight	84	8.70%
		Canid-slight, rodent-heavy	1	0.10%
		Rodent	88	9.11%
		Canid	18	1.86%
		Canid and rodent	4	0.41%
	Bos taurus Total		**316**	**32.71%**
	Canis familiaris			
		Rodent-slight	1	0.10%
		Rodent	3	0.31%
	Canis familiaris Total		**4**	**0.41%**
	Capra hircus			
		Canid-medium	2	0.21%
		Canid-slight	8	0.83%
		Rodent-heavy	4	0.41%
		Rodent-medium	13	1.35%
		Rodent-slight	6	0.62%
		Rodent	5	0.52%
		Canid	1	0.10%
	Capra hircus Total		**39**	**4.04%**
	Ovis aries			
		Canid-heavy	1	0.10%
		Canid-medium	4	0.41%
		Canid-slight	9	0.93%
		Canid-slight, rodent-medium	1	0.10%
		Rodent-heavy	11	1.14%
		Rodent-medium	32	3.31%
		Rodent-slight	19	1.97%
		Rodent	42	4.35%
		Canid	4	0.41%
	Ovis aries Total		**123**	**12.73%**

Table 90 cont. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
	Ovis/Capra			
		Canid-medium	10	1.04%
		Canid-slight	10	1.04%
		Rodent-heavy	25	2.59%
		Rodent-medium	50	5.18%
		Rodent-slight	34	3.52%
		Rodent	103	10.66%
		Canid	10	1.04%
		Canid and rodent	2	0.21%
	Ovis/Capra Total		**244**	**25.26%**
Domestic Total			**726**	**75.16%**
Unknown				
	Mammal-Large			
		Canid-heavy	3	0.31%
		Canid-medium	8	0.83%
		Canid-slight	8	0.83%
		Rodent-heavy	6	0.62%
		Rodent-medium	9	0.93%
		Rodent-slight	16	1.66%
	Mammal-Large Total		**50**	**5.18%**
	Mammal-Medium			
		Canid-heavy	3	0.31%
		Canid-medium	2	0.21%
		Canid-slight	6	0.62%
		Rodent-heavy	25	2.59%
		Rodent-medium	37	3.83%
		Rodent-slight	9	0.93%
	Mammal-Medium Total		**82**	**8.49%**
	Mammal-Small			
		Rodent-medium	1	0.10%
	Mammal-Small Total		**1**	**0.10%**
	Mammal-Unidentifiable			
		Canid-slight, rodent-medium	1	0.10%
		Rodent-heavy	2	0.21%
		Rodent-slight	1	0.10%
	Mammal-Unidentifiable Total		**4**	**0.41%**
Unknown Total			**137**	**14.18%**

Table 90 cont. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
Wild				
	Aepyceros melampus			
		Rodent-medium	1	0.10%
	Aepyceros melampus Total		**1**	**0.10%**
	Bovid Class 1			
		Canid-slight	2	0.21%
		Rodent	1	0.10%
	Bovid Class 1 Total		**3**	**0.31%**
	Bovid Class 2			
		Canid-slight, rodent-slight	1	0.10%
		Rodent-heavy	1	0.10%
		Rodent-medium	3	0.31%
		Rodent-slight	2	0.21%
	Bovid Class 2 Total		**7**	**0.72%**
	Bovid Class 3			
		Rodent-heavy	2	0.21%
		Rodent-medium	4	0.41%
		Rodent-slight	1	0.10%
	Bovid Class 3 Total		**7**	**0.72%**
	Cercopithecus pygerythus			
		Rodent	1	0.10%
	Cercopithecus pygerythus Total		**1**	**0.10%**
	Crocodilus niloticus			
		Rodent	1	0.10%
	Crocodilus niloticus Total		**1**	**0.10%**
	Equus sp.			
		Rodent	1	0.10%
	Equus sp. Total		**1**	**0.10%**
	Francolinus swainsonii			
		Rodent	1	0.10%
	Francolinus swainsonii Total		**1**	**0.10%**

Table 90 cont. Frequency and type of gnawing by species.

Domestication	Species	Gnawing Type	NISP	%
	Hippopotamus amphibius			
		Canid-medium	6	0.62%
		Canid-slight	7	0.72%
		Rodent	3	0.31%
		Canid	1	0.10%
	Hippopotamus amphibius Total		**17**	**1.76%**
	Lepus sp.			
		Rodent-heavy	1	0.10%
		Rodent-slight	1	0.10%
	Lepus sp. Total		**2**	**0.21%**
	Mammal-Very Large			
		Canid-slight	1	0.10%
	Mammal-Very Large Total		**1**	**0.10%**
	Numida meleagris			
		Rodent	2	0.21%
	Numida meleagris Total		**2**	**0.21%**
	Suid sp.			
		Rodent-slight	1	0.10%
		Rodent	1	0.10%
	Suid sp. Total		**2**	**0.21%**
	Sylvicapra grimmia			
		Rodent-heavy	1	0.10%
		Rodent-medium	2	0.21%
		Rodent	2	0.21%
		Canid	1	0.10%
	Sylvicapra grimmia Total		**6**	**0.62%**
	Tragelaphus angasi			
		Rodent	2	0.21%
	Tragelaphus angasi Total		**2**	**0.21%**
	Varanus sp.			
		Rodent-heavy	1	0.10%
		Rodent-medium	1	0.10%
	Varanus sp. Total		**2**	**0.21%**
Wild Total			**56**	**5.80%**

Table 90 cont. Frequency and type of gnawing by species.

Domestication Wild?	Species	Gnawing Type	NISP	%
	Bovid Class 1			
		Canid-slight	2	0.21%
		Rodent-slight	2	0.21%
		Rodent	3	0.31%
	Bovid Class 1 Total		**7**	**0.72%**
	Bovid Class 2			
		Canid-medium	2	0.21%
		Canid-slight	2	0.21%
		Canid-slight, rodent-medium	1	0.10%
		Rodent-heavy	3	0.31%
		Rodent-medium	1	0.10%
		Rodent-slight	1	0.10%
		Rodent	10	1.04%
	Bovid Class 2 Total		**20**	**2.07%**
	Bovid Class 3			
		Canid-heavy	1	0.10%
		Canid-medium	1	0.10%
		Canid-medium, rodent-slight	1	0.10%
		Canid-slight	3	0.31%
		Rodent-heavy	1	0.10%
		Rodent-medium	5	0.52%
		Rodent	4	0.41%
		Canid	2	0.21%
	Bovid Class 3 Total		**18**	**1.86%**
	Canis sp.			
		Rodent-heavy	1	0.10%
		Rodent-medium	1	0.10%
	Canis sp. Total		**2**	**0.21%**
Wild? Total			**47**	**4.87%**
Grand Total			**966**	**100.00%**

Table 90. Frequency of level of fragmentation by element size and site area.

	Dung		Midden 1		Midden 2		Midden 3		Mound		Surface	
Size	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%
1. Complete	648	3.01%	65	3.72%	34	1.91%	16	0.39%	1459	9.25%		0.00%
2. Three-quarters	490	2.27%	37	2.12%	25	1.40%	25	0.61%	829	5.26%		0.00%
3. Half	936	4.34%	52	2.98%	57	3.20%	49	1.20%	797	5.05%		0.00%
4. One-quarter	1835	8.51%	139	7.96%	145	8.15%	105	2.58%	1425	9.04%	1	4.17%
5. Less than one-quarter	8489	39.38%	902	51.66%	1163	65.34%	1263	31.05%	2865	18.17%	9	37.50%
6. Less than one-tenth	8902	41.30%	551	31.56%	356	20.00%	2609	64.15%	6062	38.44%	14	58.33%
7. Splinter	254	1.18%		0.00%		0.00%		0.00%	2332	14.79%		0.00%
Grand Total	**21554**	**100%**	**1746**	**100%**	**1780**	**100%**	**4067**	**100%**	**15769**	**100%**	**24**	**100%**

Table 91 cont. Frequency of level of fragmentation by element size and site area.

Transect 1		Transect 2		Total NISP	Total %
NISP	%	NISP	%		
9	1.31%	4	1.25%	2235	4.86%
9	1.31%	2	0.63%	1417	3.08%
23	3.35%	9	2.82%	1923	4.19%
58	8.44%	2	0.63%	3710	8.07%
440	64.05%	72	22.57%	15203	33.09%
148	21.54%	230	72.10%	18872	41.07%
	0.00%		0.00%	2586	5.63%
687	**100%**	**319**	**100%**	**45946**	**100%**

Table 92. Frequency of fragmentation by fragment size and secure horizon.

	1. Lower		2. Middle		3. Upper		3a. Upper		3b. Upper		4. Plough	
Size	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**
1. Complete	432	4.49%	962	4.76%		0.00%	46	3.06%	53	14.44%	272	3.39%
2. Three-quarters	252	2.62%	613	3.04%		0.00%	19	1.27%	61	16.62%	62	0.77%
3. Half	466	4.84%	914	4.53%		0.00%	38	2.53%	28	7.63%	165	2.06%
4. One-quarter	897	9.32%	1649	8.16%		0.00%	125	8.33%	94	25.61%	251	3.13%
5. Less than one-quarter	3752	39.00 %	7136	35.33%	6	33.33%	537	35.78%	109	29.70%	2026	25.24%
6. Less than one-tenth	3777	39.26 %	8200	40.60%	12	66.67%	736	49.03%	22	5.99%	3795	47.28%
7. Splinter	44	0.46%	722	3.57%		0.00%		0.00%		0.00%	1456	18.14%
Grand Total	**9620**	**100%**	**2019 6**	**100%**	**18**	**100%**	**1501**	**100%**	**367**	**100%**	**8027**	**100%**

Table 92 cont. Frequency of fragmentation by fragment size and secure horizon.				
	5. Surface		**Total NISP**	**Total %**
1. Complete		0.00%	1765	4.44%
2. Three-quarters		0.00%	1007	2.53%
3. Half		0.00%	1611	4.05%
4. One-quarter	1	4.17%	3017	7.59%
5. Less than one-quarter	9	37.50%	13575	34.15%
6. Less than one-tenth	14	58.33%	16556	41.65%
7. Splinter		0.00%	2222	5.59%
Grand Total	**24**	**100%**	**39753**	**100.00%**

Table 93. Frequency of bone tools and adornment at Ndondondwane.

Modification Type	NISP	%
Adornment-shell bead debitage	6	1.63%
Ornament	1	0.27%
Ornament with perforation, possible pendant	1	0.27%
Ornament?	1	0.27%
Ornament-bangle	45	12.20%
Ornament-disk	1	0.27%
Ornament-pendant	19	5.15%
Ornament-ring/bangle	1	0.27%
Tool	46	12.47%
Tool?	20	5.42%
Tool-awl	35	9.49%
Tool-awl?	2	0.54%
Tool-burnishing	2	0.54%
Tool-burnishing ?	1	0.27%
Tool-comb?	1	0.27%
Tool-fork?	1	0.27%
Tool-game piece	1	0.27%
Tool-handle	1	0.27%
Tool-handle	1	0.27%
Tool-handle?	4	1.08%
Tool-link shaft	3	0.81%
Tool-link shaft/point	1	0.27%
Tool-needle	7	1.90%
Tool-needle?	1	0.27%
Tool-point	160	43.36%
Tool-scoop	1	0.27%
Tool-scrap	1	0.27%
Tool-shaft of awl or point	1	0.27%
Unsure	1	0.27%
Worked?	3	0.81%
Grand Total	**369**	**100.00%**

Table 94. Frequency of tool and adornment type by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Total NISP	Total %
Modification - ornament or tool	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%		
Adornment-shell bead debitage		0.00%		0.00%		0.00%	6	2.21%		0.00%	6	1.63%
Ornament	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Ornament with perforation, possible pendant	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Ornament?		0.00%		0.00%		0.00%	1	0.37%		0.00%	1	0.27%
Ornament-bangle	5	5.68%	1	16.67%		0.00%	39	14.34%		0.00%	45	12.20%
Ornament-disk		0.00%		0.00%		0.00%	1	0.37%		0.00%	1	0.27%
Ornament-pendant	6	6.82%		0.00%		0.00%	13	4.78%		0.00%	19	5.15%
Ornament-ring/bangle		0.00%		0.00%		0.00%	1	0.37%		0.00%	1	0.27%
Tool	28	31.82%	2	33.33%		0.00%	16	5.88%		0.00%	46	12.47%
Tool?	6	6.82%		0.00%	1	50.00%	13	4.78%		0.00%	20	5.42%
Tool-awl	17	19.32%	3	50.00%	1	50.00%	13	4.78%	1	100.00%	35	9.49%
Tool-awl?		0.00%		0.00%		0.00%	2	0.74%		0.00%	2	0.54%
Tool-burnishing	2	2.27%		0.00%		0.00%		0.00%		0.00%	2	0.54%
Tool-burnishing ?	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-comb?	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-fork?		0.00%		0.00%		0.00%	1	0.37%		0.00%	1	0.27%
Tool-game piece	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-handle		0.00%		0.00%		0.00%	1	0.37%		0.00%	1	0.27%
Tool-handle	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-handle?		0.00%		0.00%		0.00%	4	1.47%		0.00%	4	1.08%
Tool-link shaft	2	2.27%		0.00%		0.00%	1	0.37%		0.00%	3	0.81%
Tool-link shaft/point	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-needle	4	4.55%		0.00%		0.00%	3	1.10%		0.00%	7	1.90%
Tool-needle?	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%

Table 94 cont. Frequency of tool and adornment type by area.

	Dung		Midden 1		Midden 2		Mound		Transect 1		Total NISP	Total %
Modification - ornament or tool	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Tool-point	6	6.82%		0.00%		0.00%	154	56.62%		0.00%	160	43.36%
Tool-scoop	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-scrap	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Tool-shaft of awl or point	1	1.14%		0.00%		0.00%		0.00%		0.00%	1	0.27%
Unsure		0.00%		0.00%		0.00%	1	0.37%		0.00%	1	0.27%
Worked?	1	1.14%		0.00%		0.00%	2	0.74%		0.00%	3	0.81%
Grand Total	**88**	**100.00%**	**6**	**100.00%**	**2**	**100.00%**	**272**	**100.00%**	**1**	**100.00%**	**369**	**100.00%**

Table 95. Frequency of polish by level and area.

	High		Light		Medium		Present		Waterworn		Total NISP	Total %
Area	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Dung	16	28.57%	42	60.00%	41	20.00%		0.00%	2	100.00%	101	30.06%
Midden 1	3	5.36%		0.00%	1	0.49%		0.00%		0.00%	4	1.19%
Midden 2		0.00%	1	1.43%	1	0.49%		0.00%		0.00%	2	0.60%
Midden 3	1	1.79%		0.00%	1	0.49%		0.00%		0.00%	2	0.60%
Mound	36	64.29%	27	38.57%	161	78.54%	3	100.00%		0.00%	227	67.56%
Grand Total	**56**	**100.00%**	**70**	**100.00%**	**205**	**100.00%**	**3**	**100.00%**	**2**	**100.00%**	**336**	**100.00%**

Table 96. Summary of attributes for site comparison to demonstrate distinctiveness of Ndondondwane.

Site	**Ndondondwane**	**KwaGandaganda**	**Wosi**	**Mamba**
Length of occupation	Less than 50 years	400 years	100-200 years	100-200 years
Total fragments	47,048 (NISP)	41,006 (NISP) NDO Phase = 22,647	6855 identifiable	1137 identifiable
Ivory	45 bangles 3529 fragments	At least 2 bangles 4262.5 grams of fragments	48 bangle fragments 379 fragments	11 fragments
Bone tools (not including beads)	164 points and link shafts 369 total modified bone and shell	72 points and link shafts No total count of modified bone and shell	24 points and link shafts 34 total modified bone and shell	4 modified bone and shell