

# **The Collection Behaviour and Taphonomic Signatures of Hyaenids**

By

**Brian F Kuhn**

A thesis submitted to the University of Pretoria, South Africa, in fulfilment for the  
requirements for the degree of Doctor of Philosophy  
Submitted in Pretoria, 15 December 2006

## Dedication

Dedicated to the memory of my father, Jesse Wayne Kuhn (September 4, 1930-  
February 15, 1997) and to my mother Bettelene Kuhn

And especially to my Uncle, Alwin Goodman Leupold  
April 27, 1925-December 10, 2006

## **Abstract**

# **The Collection Behaviour and Taphonomic Signatures of Hyaenids**

**By**

**Brian F Kuhn**

Supervisor: Professor John D. Skinner  
Co-Supervisor: Professor Lee R. Berger

Department of Anatomy and Physiology  
Wildlife Unit  
Faculty of Veterinary Science  
University of Pretoria

A thesis submitted to the University of Pretoria, South Africa, in fulfilment for the requirements for the degree of Doctor of Philosophy

The collecting behaviour of specific animals is increasingly becoming of interest to a variety of scientific disciplines. Collectors can be found in the rodent and carnivore mammal populations, as well as certain avian species. Of the carnivores it is hyaenids and leopards (*Panthera pardus*) that appear to be the most prolific collectors of faunal remains. Of the four species in the hyaena family, three are known to collect various quantities of faunal material in their prospective dens; they are spotted hyaenas (*Crocuta crocuta*), brown hyaenas (*Parahyaena brunnea*) and striped hyaenas (*Hyaena hyaena*). The question surrounding the collector of faunal remains in the archaeological record is as important as it is old. This is an in depth examination of the bone collections of all three extant hyaenids and the related taphonomy corresponding to each species. New collections were made from various dens and locations in southern Africa for both *Parahyaena* and *Crocuta*. Additionally previous collections of *Parahyaena* were reanalysed and data from *Hyaena* collections in Jordan reviewed. In all a total of 23,324 bones and bone fragments were examined during this study, specifically looking at species collected, skeletal elements, minimum number of individuals (MNI), number of identified specimens (NISP), fusion data, fragmentation, weathering and an assortment of taphonomic characteristics. Specific taphonomic characteristics recorded were crenulated edges, striations, punctate depressions and punctures, scouring, acid etching and all combinations thereof. The main thrust of this research is to determine if hyaenids in general can be positively identified from other collectors as the collector of a specific assemblage of faunal remains and to determine if the three species of hyaena can be distinguished from one another by studying the faunal collections alone.

## Acknowledgements

I would like to thank:

The Palaeoanthropological Scientific Trust (PAST) for supplying the bursary that I received for three of the four years it took to complete this project, as well as Professor Lee Berger of PURE (Palaeoanthropology Unit for Research and Exploration) and Professor Bruce Rubidge and the staff at the Bernard Price Institute (BPI), the University of the Witwatersrand, for administering and depositing the funds for me while I was in the field. Without their support and efforts this project could not have been finished.

Professor John D. Skinner for supervising me on this project, arranging my co-supervisor, Professor Lee Berger at Wits, graciously funding my fieldwork in Namibia when I was all but out of money, and allowing me to carry out independent research. Your faith in me to get this done without being over supervised was most appreciated. And last but not least, for editing drafts of this thesis expeditiously, your efforts were most appreciated.

Professor Lee Berger of the University of Witwatersrand for agreeing to act as a co-supervisor on this project, providing me with a desk and laboratory space at PURE in the early months of study, granting me unhindered access to the reference collections and fossil collections, putting me in touch with PAST and obtaining a PAST bursary, and for your insights and guidance.

Dr. Bob Brain, Dr Graham Mitchell and Dr. Liora Horwitz for their positive and constructive comments on the initial protocol.

The other folks at the University of Witwatersrand:

Dr. Darryl James de Ruiter for his initial aid in the early collections prior to heading off to Texas A & M University and for access to his thesis and his insights on QSP vs. MNI.

Dr. Lucinda Backwell for access to her thesis on bone damage and modifications.

Pedro Boshoff for showing me the art of caving and giving me access to his current work with coprolites, as well as his honours work on the Bolts Farm hyaena, his help in the field, his constant enthusiasm for the project and hyaenas in general and for putting up with me in his office during the early days.

Rodrigo Lacruz, for access to his MSc thesis and for confirming the presence of human remains amongst the Namibia/Skinner collections, also for providing an ear when questions abounded and for sharing all his insights on hyaena dentition and bringing new fossils to my attention when they surfaced. Also for helping positively identifying baboon remains from one of the hyaena dens in the diamond area of Namibia.

Ryan Franklin for his unending help in the field, both in South Africa and Botswana, his work on pathological bones and in the laboratory helping out with the analysis of every bone collected in those two regions, your time and efforts were greatly appreciated.

In addition:

My family, especially my Mom for all her support; financially and otherwise. My Uncle Al (1925-2006), for all his aid and encouragement for me to continue with my education, it is sad to see how fast one can slip away mentally after 70 plus years of being so very sharp, you will be missed. To my brothers Jess and Bill and sister in law Stacey for their moral support and encouragement. And to my Uncle Bud for his

enthusiasm and financial support when he could give it, every penny and rand you sent my way was greatly appreciated. And finally to Chris McMillan, while not family you should be, thanks for giving me a job to fall back on when I came home so I could afford to stay on here in South Africa. If not for working with you when I could I never would have come this far.

Dr. Andrew Taylor for his day in the field and giving me insight into aardvark holes and hyaena modifications of such holes.

Rietvlei Nature Reserve:

Henk Marais, Tshwane Nature Conservation, for putting me in contact with the Rietvlei Nature Reserve.

Rian Marais, Manager of Rietvlei Nature reserve for providing access to the brown hyaena in the reserve.

Karin Coetzee and other staff of Rietvlei Nature Reserve for assistance in locating the various dens located on the reserve and for taking the time to go out in the early hours of the morning and for staying out late in the evening to observe hyaena activity at the various dens.

Ryan Franklin and Dave Lorom for assisting in the collections from the Rietvlei dens; and to Ryan for aiding in the analysis of the collected remains.

Mashatu Game Reserve, Botswana:

Grant Hall for setting up contact with Mashatu Game Reserve.

The staff at Mashatu Game Reserve; especially Jeanetta Selier, Paul Grobler and Pete Le Roux. Plus Dave Lorom and Katja Koepfel for the early days scouting dens and

Ryan Franklin, Jess Kuhn, Joost Segeera and Michiel van Silfhout for helping with the collection of faunal remains. And a special thanks to Ryan for helping sort through and identify the 900 plus remains that were collected.

In Namibia:

The Ministry of Environment and Tourism (MET) for granting me permission to conduct fieldwork in Namibia.

Ingrid Wiesel of the Brown Hyena Project (Luderitz) for her help showing me her dens and giving me unhindered access to them. Tryque Cooper of MET, Luderitz, for his support for this research and NAMDEB diamond company for access to dens on restricted land, especially Diamond Area No 1.

To the staff at the Gobabeb Training and Research Centre: Dr. Joh Henschel, Helen Kolb, Mark Gardiner and especially Hartmut Kolb for his efforts trying to sort out the over heating issues with my hilux. While the time spent may not have provided me with the data I had hoped for I enjoyed the time spent in the Namib-Naukluft Park.

Ellen McMillan for aiding me with sorting out over 23,000 lines of data so I could actually get the information I needed.



## Abbreviations

BPI	Bernard Price Institute
CBRL	Council for British Research in the Levant
Dis	Distal
MET	Ministry of Environment and Tourism, Namibia
MNI	Minimum Number of Individuals
NISP	Number of Identified Specimens
PAST	Palaeoanthropological Scientific Trust
Prox	Proximal
PURE	Palaeoanthropology Unit for Research and Exploration
Phalanx 1	Proximal phalange
Phalanx 2	Medial phalange
Phalanx 3	Distal phalange

## Table of Contents

Dedication .....	II
Abstract .....	III
Acknowledgements .....	V
Abbreviations .....	IX
Table of Contents .....	X
List of Figures .....	XIV
List of Tables.....	XV
List of Charts.....	XVII
List of Plates.....	XXI
List of Appendices .....	XXIII
CHAPTER ONE .....	1
INTRODUCTION.....	1
BACKGROUND OF THE STUDY .....	1
AIMS AND OBJECTIVES.....	7
MATERIALS AND METHODS .....	9
SYNOPSIS .....	11
CHAPTER TWO .....	13
ECOLOGY.....	13
DISTRIBUTION.....	13
BEHAVIOURAL ECOLOGY.....	15
CHAPTER THREE.....	19
REGIONS SURVEYED AND PREVIOUS COLLECTIONS.....	19
REGIONS SURVEYED .....	19
Rietvlei Nature Reserve, South Africa.....	21

Mashatu Game Reserve, Botswana.....	22
Diamond Area No. 1 and Luderitz peninsula.....	24
Gobabeb, Namib-Naukluft Park, Namibia.....	25
SKINNER COLLECTION .....	27
CHAPTER FOUR.....	28
RESULTS OF SURVEYED REGIONS.....	28
Rietvlei Nature Reserve, South Africa.....	28
Mashatu Game Reserve, Botswana.....	31
Diamond Area No. 1 and Luderitz Peninsula.....	33
Gobabeb, Namib-Naukluft Park, Namibia.....	39
CHAPTER 5.....	41
RESULTS .....	41
Overview .....	41
<i>Crocuta crocuta</i> assemblages .....	45
Mashatu Den 1 .....	45
Mashatu Den 2 .....	51
Mashatu Den 3 .....	56
Mashatu Den 4 .....	62
Gobabeb Den NN-1.....	67
Gobabeb Den NN-2.....	70
<i>Parahyaena brunnea</i> assemblages.....	71
Rietvlei Den R01.....	71
Rietvlei Den R02.....	75
Rietvlei Den R03.....	79
Brown Hyaena Project D-P 1 .....	81

Brown Hyaena Project D-P 2.....	86
Brown Hyaena Project D-P 4.....	91
Brown Hyaena Project D-P 9.....	97
Brown Hyaena Project D-P 11.....	103
Brown Hyaena Project D-P 16.....	108
Brown Hyaena Project D-P 18.....	113
Brown Hyaena Project D-SPG 1.....	119
Brown Hyaena Project D-BB 1.....	125
Skinner Collection.....	131
Gladysvale.....	136
CHAPTER 6.....	139
Discussion .....	139
<i>Hyaena hyaena</i> assemblages.....	139
Jordan .....	139
Brief summation.....	148
<i>Crocuta crocuta</i> assemblages .....	149
Mashatu .....	149
Gobabeb .....	152
Brief summation.....	153
<i>Parahyaena brunnea</i> assemblages.....	154
Rietvlei .....	154
Brown Hyaena Project Namibia.....	156
Skinner Collection.....	161
Gladysvale.....	162
Brief summation.....	162

Comparative between the three hyaenids.....	164
Criteria for distinguishing between hyaena or hominid.....	170
CHAPTER 7.....	173
Conclusion.....	173
Trends of hyaenid assemblages.....	173
Criteria for distinguishing between hyaena or hominid.....	178
Further research.....	179
REFERENCES.....	180
PLATES .....	i
APPENDICES.....	xvi

## List of Figures

Figure 1: Ranges of <i>Hyaena</i> , <i>Crocuta</i> and <i>Parahyaena</i> .....	14
Figure 2: Map showing den localities .....	20
Figure 3: Map showing location of Rietvlei Nature Reserve.....	22
Figure 4: Map showing location of Mashatu Game Reserve.....	23
Figure 5: Map showing locations of Luderitz, Diamond Area 1 and Gobabeb .....	26
Figure 6: Rietvlei den locations .....	30
Figure 7: Map of Mashatu Game Reserve showing study area .....	33
Figure 8: Peninsula and Skinner Dens .....	35
Figure 9: Atlas Bay Den, D-SPG 1 .....	38
Figure 10: Bakers Bay Den, D-BB 1 .....	39
Figure 11: Map of Jordan showing the study areas.....	140

## List of Tables

Table 1: All species.....	44
Table 2: Species NISP & MNI Mashatu Den 1 .....	46
Table 3: Elements with species breakdown, Mashatu Den 1.....	48
Table 4: Species NISP & MNI Mashatu Den 2 .....	52
Table 5: Elements with species breakdown, Mashatu Den 2.....	53
Table 6: Species NISP & MNI Mashatu Den 3 .....	57
Table 7: Elements with species breakdown, Mashatu Den 3.....	58
Table 8: Species NISP & MNI Mashatu Den 4 .....	62
Table 9: Elements with species breakdown, Mashatu Den 4.....	63
Table 10: Species NISP & MNI Gobabeb Den NN-1 .....	67
Table 11: Elements with species breakdown, Gobabeb Den NN-1 .....	68
Table 12: Species NISP & MNI Rietvlei Den R01.....	71
Table 13: Elements with species breakdown, Rietvlei Den R01 .....	72
Table 14: Species NISP & MNI Rietvlei Den R02.....	75
Table 15: Elements with species breakdown, Rietvlei Den R02 .....	76
Table 16: Species NISP & MNI Rietvlei Den R03.....	79
Table 17: Elements with species breakdown, Rietvlei Den R03 .....	80
Table 18: Species NISP & MNI Brown Hyaena Project D-P 1.....	81
Table 19: Elements with species breakdown, Brown Hyaena Project D-P 1 .....	82
Table 20: Species NISP & MNI Brown Hyaena Project D-P 2.....	86
Table 21: Elements with species breakdown, Brown Hyaena Project D-P 2 .....	87
Table 22: Species NISP & MNI Brown Hyaena Project D-P 4.....	92
Table 23: Elements with species breakdown, Brown Hyaena Project D-P 4 .....	93
Table 24: Species NISP & MNI Brown Hyaena Project D-P 9.....	98

Table 25: Elements with species breakdown, Brown Hyaena Project D-P 9 .....	100
Table 26: Species NISP & MNI, Brown Hyaena Project D-P 11 .....	103
Table 27: Elements with species breakdown, Brown Hyaena Project D-P 11 .....	104
Table 28: Species NISP & MNI Brown Hyaena Project D-P 16.....	108
Table 29: Elements with species breakdown, Brown Hyaena Project D-P 16 .....	110
Table 30: Species NISP & MNI Brown Hyaena Project D-P 18.....	114
Table 31: Elements with species breakdown, Brown Hyaena Project D-P 18 .....	115
Table 32: Species NISP & MNI Brown Hyaena Project D-SPG 1.....	120
Table 33: Elements with species breakdown, Brown Hyaena Project D-SPG 1 .....	121
Table 34: Species NISP & MNI Brown Hyaena Project D-BB 1.....	126
Table 35: Elements with species breakdown, Brown Hyaena Project D-BB 1 .....	127
Table 36: Species NISP & MNI Skinner Collection.....	132
Table 37: Elements with species breakdown, Skinner Collection.....	134
Table 38: Species NISP & MNI Gladysvale.....	136
Table 39: Elements with species breakdown, Gladysvale .....	137
Table 40: Species NISP per Den, Jordan .....	141



## List of Charts

Chart 1: Specimen per den .....	42
Chart 2: Skeletal Elements .....	42
Chart 3: Fragmentation Patterns, Regions & Collections .....	43
Chart 4: Carnivore Damage, Regions & Collections .....	45
Chart 5: Elements, Mashatu Den .....	47
Chart 6: Fragmentation, Mashatu Den 1 .....	49
Chart 7: Weathering, Mashatu Den 1 .....	50
Chart 8: Carnivore Damage, Mashatu Den 1 .....	51
Chart 9: Elements, Mashatu Den 2 .....	53
Chart 10: Fragmentation, Mashatu Den 2 .....	54
Chart 11: Weathering, Mashatu Den 2 .....	55
Chart 12: Carnivore Damage, Mashatu Den 2 .....	56
Chart 13: Elements, Mashatu Den 3 .....	59
Chart 14: Fragmentation, Mashatu Den 3 .....	60
Chart 15: Weathering, Mashatu den 3 .....	60
Chart 16: Carnivore Damage, Mashatu Den 3 .....	61
Chart 17: Elements, Mashatu Den 4 .....	64
Chart 18: Fragmentation, Mashatu Den 4 .....	65
Chart 19: Weathering, Mashatu Den 4 .....	66
Chart 20: Carnivore Damage, Mashatu Den 4 .....	67
Chart 21: Elements, Gobabeb Den NN-1 .....	68
Chart 22: Fragmentation, Gobabeb Den NN-1 .....	69
Chart 23: Weathering, Gobabeb Den NN-1 .....	70
Chart 24: Elements, Rietvlei Den R01 .....	72

Chart 25: Fragmentation, Rietvlei Den R01 .....	73
Chart 26: Weathering, Rietvlei Den R01 .....	74
Chart 27: Carnivore Damage, Rietvlei Den R01 .....	75
Chart 28: Elements, Rietvlei Den R02.....	76
Chart 29: Fragmentation, Rietvlei Den R02 .....	77
Chart 30: Weathering, Rietvlei Den R02.....	78
Chart 31: Carnivore Damage, Rietvlei Den R02 .....	79
Chart 32: Elements, Brown Hyaena Project D-P 1 .....	83
Chart 33: Fragmentation, Brown Hyaena Project D-P 1.....	84
Chart 34: Weathering, Brown Hyaena Project D-P 1 .....	85
Chart 35: Carnivore Damage, Brown Hyaena Project D-P 1.....	86
Chart 36: Elements, Brown Hyaena Project D-P 2 .....	88
Chart 37: Fragmentation, Brown Hyaena Project D-P 2.....	89
Chart 38: Weathering, Brown Hyaena Project D-P 2 .....	90
Chart 39: Carnivore Damage, Brown Hyaena Project D-P 2.....	91
Chart 40: Elements, Brown Hyaena Project D-P 4 .....	94
Chart 41: Fragmentation, Brown Hyaena Project D-P 4.....	95
Chart 42: Weathering, Brown Hyaena Project D-P 4 .....	96
Chart 43: Carnivore Damage, Brown Hyaena Project D-P 4.....	97
Chart 44: Elements, Brown Hyaena Project D-P 9 .....	100
Chart 45: Fragmentation, Brown Hyaena Project D-P 9.....	101
Chart 46: Weathering, Brown Hyaena Project D-P 9 .....	102
Chart 47: Carnivore Damage, Brown Hyaena Project D-P 9.....	103
Chart 48: Elements, Brown Hyaena Project D-P 11 .....	105
Chart 49: Fragmentation, Brown Hyaena Project D-P 11.....	106

Chart 50: Weathering, Brown Hyaena Project D-P 11 .....	106
Chart 51: Carnivore Damage, Brown Hyaena Project D-P 11.....	107
Chart 52: Elements, Brown Hyaena Project D-P 16.....	109
Chart 53: Fragmentation, Brown Hyaena Project D-P 16.....	111
Chart 54: Weathering, Brown Hyaena Project D-P 16 .....	112
Chart 55: Carnivore Damage, Brown Hyaena Project D-P 16.....	113
Chart 56: Elements, Brown Hyaena Project D-P 18 .....	116
Chart 57: Fragmentation, Brown Hyaena Project D-P 18.....	117
Chart 58: Weathering, Brown Hyaena Project D-P 18 .....	118
Chart 59: Carnivore Damage, Brown Hyaena Project D-P 18.....	119
Chart 60: Elements, Brown Hyaena Project D-SPG 1 .....	122
Chart 61: Fragmentation, Brown Hyaena Project D-SPG 1 .....	123
Chart 62: Weathering, Brown Hyaena Project, D-SPG 1 .....	124
Chart 63: Carnivore Damage, Brown Hyaena Project D-SPG 1 .....	125
Chart 64: Elements, Brown Hyaena Project D-BB 1 .....	128
Chart 65: Fragmentation, Brown Hyaena Project D-BB 1 .....	129
Chart 66: Weathering, Brown Hyaena Project D-BB 1 .....	130
Chart 67: Carnivore Damage, Brown Hyaena Project D-BB 1 .....	131
Chart 68: Elements, Skinner Collection.....	134
Chart 69: Fragmentation, Skinner Collection .....	135
Chart 70: Carnivore Damage, Skinner Collection .....	136
Chart 71: Fragmentation, Gladysvale .....	137
Chart 72: Carnivore Damage, Gladysvale .....	138
Chart 73: Elements, Striped Hyaena Dens.....	142
Chart 74: Fragmentation, Jawa Den 4.....	143

Chart 75: Canivore Damage, Jawa Den 4.....	143
Chart 76: Fragmentation, Jawa Den 7.....	144
Chart 77: Fragmentation, Al-Arteen Den 13.....	145
Chart 78: Fragmentation, Al-Arteen Den 13.....	146
Chart 79: Carnivore Damage, Al-Arteen Den 13.....	147
Chart 80: Fragmentation, Dhahik Den 32.....	148

## List of Plates

Plate 1: Rietvlei Nature Reserve, Den R01 .....	i
Plate 2: Rietvlei Nature Reserve, Den R02 (arrows show den openings).....	ii
Plate 3: Rietvlei Nature Reserve, Den R02.....	ii
Plate 4: Rietvlei Nature Reserve, Den R03.....	iii
Plate 5: Rietvlei Nature Reserve, Den R03.....	iii
Plate 6: Mashatu Den 1 (opening at base of rocks beyond bone scatter).....	iv
Plate 7: Mashatu Den 1 .....	iv
Plate 8: Mashatu Den 2 .....	v
Plate 9: Mashatu Den 3 .....	v
Plate 10: Mashatu Den 4 .....	vi
Plate 11: Mashatu Den 4, Impala mandible hanging from roof.....	vi
Plate 12: Brown Hyaena Project D-P 1.....	vii
Plate 13: Brown Hyaena Project D-P 2.....	vii
Plate 14: Brown Hyaena Project D-P 4.....	viii
Plate 15: Brown Hyaena Project D-P 9.....	viii
Plate 16: Brown Hyaena Project D-P 18.....	ix
Plate 17: Cape Fur Seal pup carcass with atypical skull damage .....	ix
Plate 18: Brown Hyaena Project D-P 18.....	x
Plate 19: Brown Hyaena Project D-P 16.....	x
Plate 20: Brown Hyaena Project D-SPG 1.....	xi
Plate 21: Brown Hyaena Project D-BB 1.....	xi
Plate 22: Gobabeb Den NN-1 .....	xii
Plate 23: Gobabeb Den NN-2 .....	xii
Plate 24: Punctate depression.....	xiii

Plate 25: Crenulated edges ..... xiii

Plate 26: Scouring ..... xiv

Plate 27: Punctate & Crenulated edge..... xiv

Plate 28: Jordan Den, Jawa 4 ..... xv

Plate 29: Jordan Den, Dhahik 32.....xv

## List of Appendices

APPENDIX A: Mashatu Den 1 Bone Damage.....	xvi
APPENDIX B: Mashatu Den 2 Bone Damage.....	xviii
APPENDIX C: Mashatu Den 3 Bone Damage.....	xx
APPENDIX D: Mashatu Den 4 Bone Damage.....	xxi
APPENDIX E: Rietvlei Den R01 Bone Damage.....	xxvii
APPENDIX F: Rietvlei Den R02 Bone Damage.....	xxviii
APPENDIX G: Rietvlei Den R03 Bone Damage .....	xxix
APPENDIX H: Brown Hyaena Project D-P 1 Bone Damage .....	xxx
APPENDIX I: Brown Hyaena Project D-P 2 Bone Damage.....	xxxii
APPENDIX J: Brown Hyaena Project D-P 4 Bone Damage.....	xxxv
APPENDIX K: Brown Hyaena Project D-P 9 Bone Damage .....	xlvi
APPENDIX L: Brown Hyaena Project D-P 11 Bone Damage.....	lxxvi
APPENDIX M: Brown Hyaena Project D-P 16 Bone Damage.....	lxxviii
APPENDIX N: Brown Hyaena Project D-P 18 Bone Damage .....	xcvi
APPENDIX O: Brown Hyaena Project D-SPG 1 Bone Damage .....	cxiv
APPENDIX P: Brown Hyaena Project D-BB 1 Bone Damage.....	cxxxvii
APPENDIX Q: Skinner Collection Bone Damage .....	clvii
APPENDIX R: Gladysvale Bone Damage .....	cclxiii