



**Analysis of the faunal remains of Kemp's Caves
and an investigation into possible computerized
classification of bones.**

by

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I hereby declare that the dissertation
Analysis of the faunal remains of Kemp's Caves
and an investigation into possible computerized classification of bones.

which I

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am submitting to the

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for the degree

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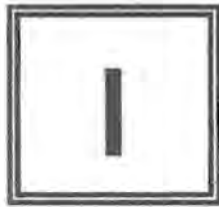
is my own work and has not been submitted by me to
any other university for degree purposes.

Elaine Swanepoel

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FOREWORD



"Pieces of ancient bone lack the aesthetic appeal of artefacts or the grandeur of ancient buildings, yet they have a complex fascination that arises in part from their zoological origin, as evidence of long-dead animals, and in part from what we can infer from them about past human activities, and about the involvement of people in those animals' lives"

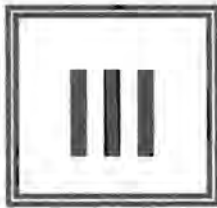
TERRY O' CONNOR, 2000

In his book, *The Archaeology of Animal Bones*, O' Connor mentions a hobby very few people appreciate.....collecting bones. My fascination with bones has lead to a small personal collection which will probably grow until it is not so small anymore!! Standard practice for my husband on a game farm is to stop whenever a white, sunburnt skeleton catches my expert eye. Many a times I have stood over a boiling Jik and OMO filled gallon drum, stirring the newest members to my collection.

Fascination however, only gets you halfway through, and even my undying love of bones could not keep me motivated at all times. It is only after completing this study I realized how much I still do not know, and that I might spend a lifetime learning and not possess half the knowledge of the great archaeozoologists.

However, I am still going to try.

THE BONE COLLECTOR



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I am grateful for friends and family for their prayers and encouragement: My parents for their guidance and support, financially and emotionally, during my studies and their undying faith in my abilities; For Marlene and Coen for the time consuming task of correcting my English grammar. My love and appreciation goes to my husband for the thousands of measurement values that he took down patiently as I spoke. Last, but not least, I thank God, for He made this all possible.



ABSTRACT AND KEYWORDS



ABSTRACT

Kemp's Caves are situated 2 km west of Krugersdorp in the Ngonyama Game Reserve. An abundance of fossilized as well as modern specimens have been excavated from this site since 1992. The Electron Spin Resonance dates for this site range from 140 000 to 11 000 BP¹. The faunal analysis of animal remains recovered at fossil sites assists in the dating of the site, and may also give insight into the diet and behaviour of the related hominids which previously occupied the area^{2,3,4}.

Therefore, all excavated faunal specimens of Kemp's caves were analysed by comparing them to modern skeletal material at the National Flagship Institution. The analysis did not reject the ESR dates and showed that there were no drastic climatic changes in this area during the past 100 000 years. Approximately 3% of the faunal material could be identified to species level, while 11.5 % were assigned to different faunal classes. Five individual specimens belonging to the extinct species *Equus capensis* (Cape horse) included three molars and two humeral fragments. Bovidae size classes II and III were the most represented category, which may indicate that either leopards or hyaenas were responsible for the accumulation of the faunal remains. Contradicting this assumption, is the fact that 11% of the faunal material excavated have been burnt to some extent, which may indicate human activity.

Faunal analysis comprises of the correct identification of animal bone fragments. Conventionally, this is done by morphologically comparing the specimen to its modern counterpart. Identifiable fragments, if possible, are classified to species level while the rest are assigned to different size classes^{3,4}. This is a time consuming

task and not many experts are available. The secondary aim of this study was thus to investigate the possibility of identifying animal bones through computerized methods. Osteometric data of the hind limb long bones of 30 Southern African Bovid species was obtained, using as many as possible modern specimens of adults from several South African museums. Forty-five measurements were taken on the femur, tibia and metatarsal. These 18 000 measurements were used in an attempt to develop a computerized database programme to aid in the identification of bones. Ten specimens from the Kemp's Caves collection of conventionally identified bones as well as ten modern specimens were measured to test the accuracy of the developed computer programme.

Statistically, the three long bones showed significant differences between the species in the Bov II, III and IV size classes. Bov I species, however, showed significant differences in the metatarsal measurements only. Three robusticity indices were calculated, but showed overlap in all species except the African buffalo. Only 20% of the Kemp's Caves specimens were positively identified by the programme (displayed the identified species as having the highest percentage probability). The rest showed varied percentages of possibilities. The modern specimens had a 40% accuracy rate. However, many species within the database, especially in the Bov I size class, were only represented by a few modern skeletons. This may have contributed to the Bov I class not showing significant differences. Results of this preliminary study were promising, but larger samples and further statistical evaluation may enhance the accuracy of the programme.

KEYWORDS

Archaeozoology, Kemp's Caves, Faunal analysis, Osteometric morphology,
Computerized identification, Animal bones, Bovidae

OPSOMMING EN KERNWOORDE



OPSOMMING

Kemp's Caves is 2km vanaf Krugersdorp in die Ngonyama Natuurresewaat geleë. Sedert 1992 het opgrawings van hierdie terrein 'n rykdom gefossileerde en moderne elemente opgelewer. Resultate van die Elektron Spin Resonansie (ESR) het datums van 140 000 tot 11 000 BP opgelewer¹. Die analise van fauna wat herwin word by fossielterreine ondersteun die datering van 'n terrein. Dit is ook 'n aanwysing tot die dieët en gedrag van die verwante hominiede wat moontlik die area voorheen beset het^{2,3,4}. Vir hierdie rede is die fauna van *Kemp's Caves* geanaliseer deur hulle met die moderne versameling by die NFI (*National Flagship Institution*) te vergelyk. Die analise het geen getuieus gelewer om die ESR datums te verwerp nie en het ook getoon dat daar in hierdie area geen drastiese klimaatsveranderinge gedurende die laaste 100 000 jaar was nie. Ongeveer 3% van die fauna versameling kon geïdentifiseer word, terwyl 11.5% tot die verskillende fauna klasse toegedeel is. Vyf individuele been-elemente wat tot die uitgestorwe spesie *Equus capensis* behoort het, het drie molare en twee humerus fragmente ingesluit. Hoefdier klasse II en III was die mees verteenwoordigde katogorie wat mag aandui dat luiperds of hiënas verantwoordelik was vir dié versameling van fauna. Die feit dat 11% van die elemente tot 'n sekere mate gebrand was, mag bogenoemde bewering weerspreek aangesien gebrande beenmateriaal menslike aktiwiteit aandui.

Fauna-analise is die korrekte identifisering van dierbeenfragmente. Konvensioneel word die fragmente morfologies vergelyk met hulle moderne ewebeeld. Identifiseerbare fragmente word, indien moontlik, geklassifiseer tot 'n

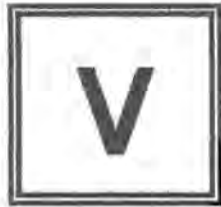
spesie, terwyl die res aangedui word as 'n spesifieke grootte klas^{3,4}. Hierdie is 'n tydrowende proses en daar is min deskundiges op die gebied. Daarom was die tweede doel van die studie om die moontlikheid van gerekenariseerde identifisering van dierbene te ondersoek. Osteometriese data van die agterbeen langbene van 30 Suider-Afrikaanse hoefdier spesies was verkry deur die meting van soveel moontlik volwasse moderne versamelings van verskeie Suid-Afrikaanse museums. Vyf-en-veertig afmetings van die femur, tibia en metatarsaal is geneem. Hierdie 18 000 afmetings is gebruik in 'n poging om 'n rekenaar databasis te ontwikkel wat hulp sal verleen tydens dierbeen identifikasie. Tien *Kemp's Caves* fragmente wat op die konvensionele metode geïdentifiseer is, sowel as tien moderne bene was gemeet om die akkuraatheid van die ontwikkelde rekenaarprogram te toets.

Die drie langbene het statisties betekenisvolle verskille tussen hoefdier II, III en IV klasse gewys. Hoefdier klas I het egter slegs betekenisvolle verskille in die metatarsaal afmetings gewys. Drie robustiteitsindekse was bereken en het oorvleueling in alle spesies gewys behalwe vir die Buffel. Net 20% van die *Kemp's Caves* elemente was positief geïdentifiseer deur die program (vertoon die spesie as die hoogste persentasie moontlikheid). Die res van die toets-elemente het 'n verskeidenheid persentasie moontlikhede gewys. Die moderne elemente het 'n 40% akkuraatheidskoers gewys. Baie spesies in die databasis, veral die hoefdier I klas, was egter slegs deur 'n paar moderne skelette verteenwoordig. Hierdie feit mag daartoe bygedra het dat hoefdier klas I nie veel betekenisvolle verskille getoon het nie. Die resultate van die studie was belowend maar groter versamelings en verdere statistiese evaluasie mag die akkuraatheid van die program verbeter.

KERNWOORDE

Argeodierkunde, *Kemp's Caves*, Fauna analise, Osteometriese morfologie,

Gerekenariseerde identifikasie, Dierbene, Hoefdiere



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