# TAXONOMY, TAPHONOMY AND SPATIAL DISTRIBUTION OF THE CERCOPITHECOID POSTCRANIAL FOSSILS FROM STERKFONTEIN CAVES

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A dissertation submitted to the Faculty of Science, University of the Witwatersrand, in fulfilment of the requirements for the higher degree of Doctor of Philosophy

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**DECLARATION**

I declare that this thesis is my own unaided work. It is submitted for the degree of PhD in the School of Geography, Archaeology and Environmental Studies, Faculty of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted for any other degree or examination in other university.

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## ABSTRACT

Fossil primates are some of the most well represented fauna in South Africa's fossil Plio-Pleistocene cave sites. Sterkfontein preserves the largest number of fossil primates and a large portion of these are cercopithecoid remains. This research project provides a taxonomic analysis of the abundant fossil cercopithecoid post-cranial limb elements discovered at the site. One thousand five hundred fourteen identifiable fossil cercopithecoid postcrania from the Sterkfontein caves are analysed. From these, five genera are identified from morphologically diagnostic postcranial elements; these are *Papio, Parapapio, Theropithecus*, *Cercopithecoides* and *Cercopithecus*. *Theropithecus* is identified in Member 4, earlier than previously known. It is established that size, form and function are important factors in taxonomic studies. They play a major role in taxonomic examinations; however, they cannot be treated as disconnected facets of a taxonomic exercise. Each plays an essential role in taxonomic analyses. The study confirms that the Member 4 environment, which illustrates the turn from the Pliocene to the Pleistocene and the most mosaic of all the Plio-Pleistocene sites of the Cradle of Humankind World Heritage Site, samples the most faunal variability in the Sterkfontein Cave deposits. This research supports the hypothesis that carnivores were not the main accumulating agent for the cercopithecoid fossil remains within the caves. The carnivores, however, impacted the fossil cercopithecoid assemblage. Leopards and hyaenas are identified as some of the carnivores which accumulated the fossil cercopithecoids within the Sterkfontein caves. The research has opened a new scope for taxonomic analysis of isolated fossil cercopithecoid postcrania in the southern African fossil cave sites.

*To my kids:"all I do is for you"*

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# CHAPTER ONE

# FOSSIL CERCOPITHECOIDEA OF THE STERKFONTEIN CAVES

## 1.1. The role of postcrania in understanding fossil cercopithecoid evolution in the Sterkfontein Caves

Southern African fossil hominin sites cover a very significant phase in the development of fossil primates and associated palaeoenvironments. This period is marked by environmental changes, climatic variability and survival through various adaptive mechanisms for these fossil primates (Jablonski & Leakey 2008). These transformations are particularly evident in the Sterkfontein fossil cave site which preserves the longest time span (4.17 My to 115,300) known for southern African fossil cave systems and has yielded the largest number of fossil primate remains. The site bears faunal evidence of these events from the Pliocene through to the late Pleistocene, therefore sampling the shift in faunal and palaeoclimatic events during that critical time in the southern African fossil record.

Fossil cercopithecoid remains have played a significant role in the development of palaeoanthropological studies in southern African fossil cave sites. The discovery of the first fossil hominin, *Australopithecus africanus* (i.e., the Taung skull), was set in motion by the numerous fossil cercopithecoid remains which were blasted out of the Taung limeworks by limeminers. A specimen of a fossil non-hominin primate was shown to Professor Raymond Dart, then head of the department of Anatomical studies at the University of the Witwatersrand, who, while taking keen interest in the fossil cercopithecoid remains, discovered a peculiar primate among breccia sent to him, which he named *Australopithecus africanus* (Dart 1925). This was to be one of the most prominent hominin discoveries of the 20$^{th}$ Century.

Fossil primates are some of the most researched and debated taxa in evolutionary studies and constitute the best represented fossil remains at Sterkfontein, particularly in Members 2 and 4.

Taxonomic analyses of the fossil cercopithecoids at Sterkfontein have mainly been based though not exclusively, on cranio-dental remains (Freedman 1957, Eisenhart 1974; Brain 1981; Kibii 2000, 2004; Pickering *et al* 2004a, Heaton 2006). This is justified as teeth are the most durable skeletal elements and are mainly reliable for taxonomic identification (Ciochon 1993). As a result, taxonomic analyses of postcranial remains have relied on association with cranio-dental specimens.

Few identified fossil cercopithecoid postcrania exist from southern African fossil cave sites. Research on the postcranial taxonomic identification has only recently been undertaken at Bolts Farm and Coopers cave sites (Gommery *et al*. 2008; De Silva *et al.* 2013). However, to date, there has been no fossil cercopithecoid postcranial remains directly associated with crania in southern African fossil cave sites. As a result, research on southern African fossil cercopithecoid has been very limited.

Most taxonomic descriptions of fossil cercopithecoid postcrania are made with reference to the East African cercopitheciods, the research on which is more advanced than in the southern African fossil cave sites. East African sites have sometimes preserved postcrania directly associated with taxonomically identifiable cranio-dental elements (Szalay & Delson 1979; Frost & Delson 2002; Jablonski *et al.* 2008; Harrison 2011). For example, the Hadar assemblage in Ethiopia and the Koobi Fora fossil sample from Kenya preserve a good sample of *Parapapio* postcrania with direct association to cranio-dental material in the East African Plio-Pleistocene (Frost & Delson 2002, Jablonski, Leakey & Anton 2008). In South Africa only the recently discovered post-crania material from Bolts Farm and Cooper's Cave have been taxonomically assigned to *Parapapio* (Gommery *et al.* 2008; De Silva *et al.* 2013). At Sterkfontein, only a few postcranial specimens from Member 4 have been investigated for taxonomic affinities (Ciochon 1993).

Although some of these have been the subject of several analyses, research theses and other publications (Pickering *et al.* 2004a, 2004b; Kibii 2000, 2004; Ogola 2009; Reynolds & Kibii 2011), only one known study by Ciochon (1993) has provided taxonomic analysis of a limited sample of the fossil cercopithecoid postcranial elements from the Sterkfontein Caves. The current study will be the first, at Sterkfontein, to provide an exclusive and comprehensive

analysis of the non-hominin fossil primate postcrania over time (from the earliest deposits, Member 2 and Jacovec Cavern to the youngest deposits such as Member 6 and Post-Member6) at the Sterkfontein Caves. This study will provide a comprehensive morphological assessment of cercopithecoid postcranial specimens with preserved diagnostic traits within the various deposits.

The challenge posed by unassociated postcrania has to allow for possible regional species variation that could impact on comparability of specimens between regions. Specimens observed in the East African region could demonstrate variability from the southern African taxa and might not be directly comparable to southern African taxa. Secondly, unlike the East African material, the Sterkfontein postcrania sample consists of highly fragmented specimens impacted by rock fall, sediment compaction and blasting damage from lime mining, as well as by excavation damage by drilling and breccia breaking. This makes identification of anatomically distinguishable landmarks difficult and in many instances not feasible.

## 1.2. Identifying fossil cercopithecoid postcrania not associated with cranio-dental remains

Studies have indicated that elbow joints are useful in identifying variation in primate locomotor modes and thus useful in taxonomic identification (Drapeau 2008). The anatomy of the primate elbow has received attention in the literature on morphology (e.g. Conroy 1976; Fleagle 1983; Rose 1973, 1974). This is because there are a number of morphological patterns in this area. In addition, the region is relatively well represented in the primate fossil record (Spoor *et al.*, 2007).

Two approaches will be undertaken to provide a thread between isolated postcranial elements and taxonomy. Independent assessments of the limb elements to make correlations to their functional significance and associated behavior will be the first methodological approach.

Comparative methods, which are also used in this study, make it possible to test the correspondence between skeletal traits and locomotor behaviour across a wide range of species while taking into account potential phylogenetic features (Spoor *et al.*, 2007). They allow inferences about individual behaviours that make up a locomotor profile, based on the most reliable indicators for behaviour (e.g., Silcox *et al.,* 2009). A comparative analysis will elucidate whether the extent to which form and associated function relate to the taxonomy of the fossil elements.

In the southern African context, fossil cercopithecoid postcranial remains have played little role in understanding taxonomic affinities, and in turn, phylogeny of the primates in the region. The abundance of fossil primate remains in the Sterkfontein deposits suggests that a large amount of data is missing from the understanding of the evolution of primates in South Africa. This has, in turn, led to reliance on data from other parts of the continent to determine a more comprehensive picture of the evolution of the fossil cercopithecoids in southern African sites. Data on the taxonomy of the postcrania will contribute to providing a more holistic overview of the Plio-Pleistocene ecosystem in the Sterkfontein valley area.

In this study I will test the hypothesis that taxonomic assignments can be made on isolated limb elements from the Sterkfontein fossil cercopithecoid assemblage. I will assess the lowest taxonomic rank to which the Sterkfontein fossil cercopithecoid postcranial elements can be assigned. The question of character combinations (qualitative assessment and size) as a predictor of function, and ultimately between taxa, will also be examined as a line of evidence for taxonomic analysis.

### 1.3. The context of fossil cercopithecoid postcrania in primate evolution of the Sterkfontein Cave site

Taphonomic analyses of fossil fauna at Sterkfontein have indicated that carnivores have had an impact on their accumulation. In cases of carnivore accumulation, tooth-mark incidence is the only reliable indicator of a collecting agent in the Sterkfontein bone assemblages (Pickering *et al.* 2004b). There has been a debate on which carnivores may have been the likely agents in the

accumulation of the primate fossils, and how this could have affected their distribution within the cave system (Brain 1981; Pickering 1999). Though new techniques have been developed, such as tooth pit data, that aid in the identification of carnivores responsible for accumulation of a bone assemblage, no study has been conducted on the Sterkfontein fossil primate remains despite carnivores being implicated in the accumulation. Thus, analysis of the tooth pit data on the fossil cercopithecoid postcrania remains may reveal the identity of the predators.

The spatial study may help to detect clusters in distribution that inform about related fossil primate bone accumulation and the general mode of accumulation within the deposits. The study will add new dimensions and offer new insights into processes of cave deposit formation. In its entirety, this study will contribute towards ongoing research on fossil primate evolution in the Sterkfontein Valley area.

### 1.4. Research aims and objectives

A comprehensive taxonomic and taphonomic study of the fossil cercopithecoid postcrania in the Sterkfontein Caves has not previously been undertaken. The core of this project will be to provide taxonomic assignment to the abundant fossil cercopithecoid post-cranial limb elements discovered at the site. The project aims to provide a qualitative and quantitative assessment of morphologically diagnostic fossil cercopithecoid postcranial remains and assign them to family, genus and, where possible, species level.

The main research hypothesis is that taxonomic discrimination of skeletal elements at tribe level will be possible and morphological discrimination at genus level will be limited. The research will-

1) examine the extent to which Sterkfontein fossil cercopithecoid postcranial morphology can be linked to taxonomy and phylogeny;
2) determine if trait, size and shape can discriminate between taxa; and
3) establish the lowest taxonomic level to which these postcranial elements can be assigned.

Secondary to the taxonomic analysis, the taphonomy of the Sterkfontein fossil primates is assessed to attempt to determine the causal agent(s) responsible for accumulating the abundant fossil primate remains concentrated in Member 2, Jacovec Cavern, Member 4, StW 53 Infill, Member 5, Member 6 and Post-Member 6 infill. This will be achieved through tooth-pit analysis of the carnivore modification marks. The research project also seeks to provide an analysis of the spatial patterning of the fossil cercopithcoid postcrania remains that will aid in the interpretations of site formation processes.

### 1.5. Fossil cercopithecoid postcrania as behavioural and taxonomic indicators

Through isolated skeletal elements it is possible to infer anatomical behavioural and environmental adaptations (Elton *et al.* 2003; Patel *et al.* 2007). Morphological analysis coupled with size assessments enable inferences to be made on behavior and taxonomic affiliations of the skeletal elements as demonstrated through a study undertaken on isolated cervical vertebrae from an early Pleistocene site of Pirro Nord Italy (Patel *et al.* 2007). In this study, morphological variation will be examined for implications on behavioural and taxonomic classification, and these will be compared to existing records on fossil cercopithecoid postcranial remains from East African sites.

## 1.6. Thesis Outline

The thesis will undertake an investigation of the fossil cercopithecoid post-crania in seven chapters.

In the introduction (Chapter 1) taxonomy, taphonomy and the spatial analysis of the Sterkfontein fossil cercopithecoids are introduced to provide the reader with a background to the thesis. The research goal is outlined as addressing taxonomy, taphonomy and spatial clustering of the fossil cercopithecoids of Sterkfontein caves including the question of the significance of trait, form and function.

Chapter 2 provides a review of the literature on studies undertaken on the fossil cercopithecoids of the site and demonstrates the gaps in the research. The link between trait, form and function is explored in detail. The extent to which postcrania can be linked to form and function and ultimately taxonomy is examined.

In Chapter 3, comparative materials and specimens under study are described. Qualitative morphological assessment of the limb elements which will lead to correlations to their functional significance and associated behavior is undertaken. This analysis is supplemented by statistical correlation with existing data on taxonomically classified postcrania to make assumptions on their possible taxonomic affinities. Bivariate linear analysis is undertaken to determine the relationship among variables. The measurements are also analysed with a Univariate Analysis of Variance (ANOVA) to assess statistical differences of the identified traits among taxonomic groups. For a broader understanding of the context of these remains in relation to the mode of accumulation, tooth pit analysis methods are presented in order to assess the nature of carnivores involved.

Chapter 4 provides the results of the morphological analysis in two sections. In section 4.1 the reader is presented with the outcome of the qualitative examination of the limb elements to provide a basis for interpretations on locomotor adaptation. The second part (section 4.2)

demonstrates the results of the statistical analysis, Linear Regression and Discriminant Function Analysis) and makes comparisons to existing statistical data on similar elements. The concluding part of this Chapter (Section 4.3) uses these results to make inferences on the taxonomic affinities of the Sterkfontein fossil cercopithecoid postcrania. Five genera are identified within the assemblage which relate to cranio-dental fossil remains previously identified within the site.

Chapter 5 provides an outline of taphonomic interpretation of the fossil remains. The most crucial aspect of this chapter is data derived from tooth pit analysis which points to the identity of some of the carnivores that participated as accumulating agents at the site. Taphonomy of the fossil cercopithecoids is compared to existing data on hominins to elucidate whether these discriminate between cercopithecoids and hominins, and the impact of these taphonomic processes is compared against bovid and carnivore remains.

Chapter 6 outlines of the spatial clustering of fossil primate remains in the Sterkfontein Caves. Spatial clustering is illustrated to search for any spatial patterns that correlate with taxonomic and size classifications.

In Chapter 7, the author provides the discussion on the taxonomy and taphonomy of the fossil cercopithecoids of the Sterkfontein Caves. The role of the cercopithecoids in the evolution of primates in the Sterkfontein Valley and South African fossil cave sites is discussed.

In the concluding chapter (Chapter 8) the author concludes that trait, size and shape are important factors in taxonomic assessments of isolated skeletal elements. The research established that isolated fossil cercopithecoid postcrania can be assigned to taxonomic level, however, in the current context, not to the lowest taxonomic level, species. The possibility of more than one *Parapapio* species within the assemblage is found. Tooth pit analysis undertaken has revealed that hyenas and leopards are the main agents involved in the accumulation of the cercopithecoid fossil remains. The spatial arrangement of the postcrania has indicated variation over time.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Study Area: Sterkfontein Cave site

The Sterkfontein fossil site is situated northwest of Johannesburg in the Gauteng Province of South Africa, within an area commonly known as Cradle of Humankind World Heritage Site. The site has yielded the largest concentrations of fossil primate remains in southern Africa (Pickering *et al.* 2004a, 2004b; Kibii 2000, 2004; Ogola 2009; Reynolds & Kibii 2011). Of these, the largest quantities are the fossil cercopithecoid remains, which outnumber fossil hominin remains, and are dominated by cranio-dental elements. The observed quantity and variety of species represented has implications for primate evolutionary research not only in the Sterkfontein Valley but in the southern African Plio-Pleistocene.

The main fossil-yielding area of the Stekfontein Cave System contains infills (Figure 2.1) that were divided into six members within the Sterkfontein Formation (Partridge 1978). Stratigraphic analysis of the cave deposits demonstrated that although the succession of infills is complex, they appear discernable (Partridge 1978; Partridge & Watt 1991). A study of the lithostratigraphy showed that each infill preserves concentrations of rock, clay and sand usually different from overlying, underlying or adjacent strata (Partridge 1978). Below is a brief outline of the stratigraphic sequence as described by Clarke (2006), as well as some dates which have been provided for the deposits. Research in recent years has determined that although Partridge's stratigraphy provides a basic framework, there are many complications in the history of deposition and these are currently being investigated in greater detail (Stratford 2009).

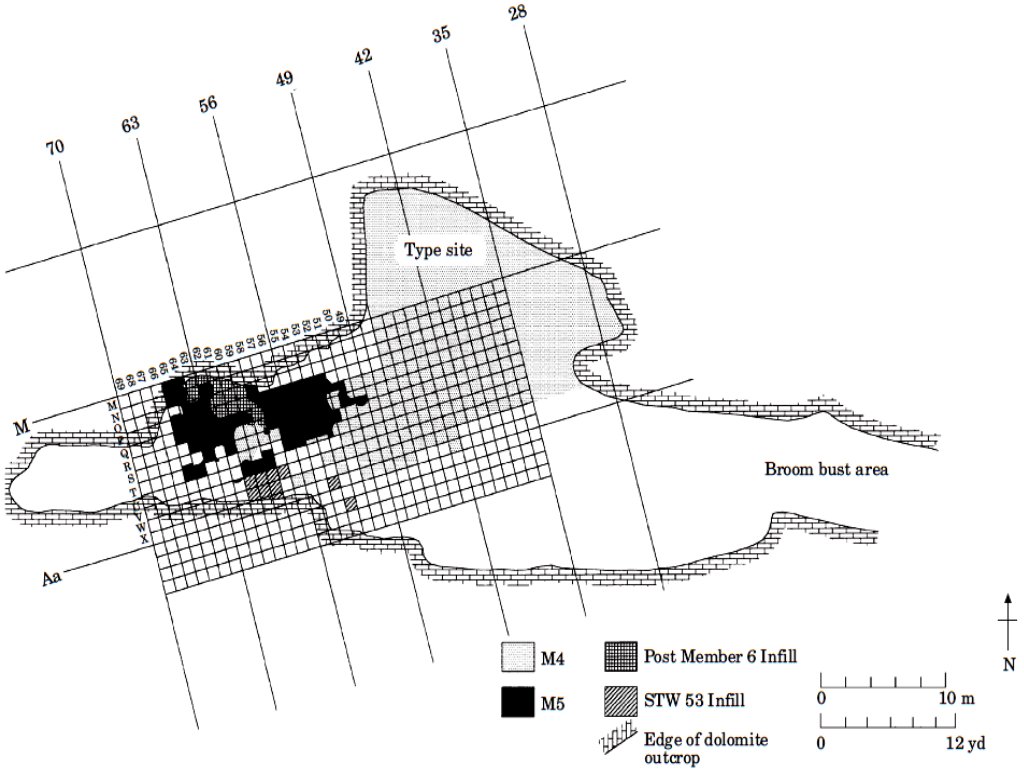


Figure 2.1. Plan view of the main Sterkfontein fossil site to show the grid system (From Kuman & Clarke 2000).

2.1.1. *Member 1*

The Member 1 deposit, which mainly occurs on the floor of the Silberberg Grotto, was the first deposit to be formed prior to the cave surface opening (Partridge 1978). It consists of collapsed dolomite and chert blocks cemented with calcium carbonate and it bears no fossil or cultural material (Stratford 2008). Partridge (1978) demonstrated that Member 1 is older than the Member 2 deposits, which were later dated by the cosmogenic nuclide burial method using Aluminum-26 and Beryllium-10 to ca. 4.17 ± 0.14 My (Partridge *et al.* 2003). Pickering and Kramers (2010) subsequently used flowstone in corings from the site and estimated that Member 1, being older than Member 2, would be >2.8 Ma based on the Uranium Lead dating of Member 2. However, their date for Member 2 is now known to be erroneous (Bruxelles *et al.* 2014).

2.1.2. *Member 2*

Member 2 formed when sediments entered from a surface opening into the Silberberg Grotto (Clarke 2002, 2008). This was accompanied by deposition of faunal material which accumulated as a result of animals falling into the cavern and being trapped or killed in the fall (Pickering *et al.* 2004a). Palaeomagnetic analysis of the Member 2 flowstones in the Silberberg Grotto had estimated them to be between 3.60 and 3.22 My (Partridge *et al*. 1999). However, this infill was subsequently dated by Aluminum$^{26}$ and Beryllium$^{10}$ burial dates to ca 4.17 ± 0.14 My (Partridge *et al.* 2003). Some other studies suggest younger dates, for example, U-Pb dates on the flowstone estimate Member 2 to be between 2.8-2.6 My and, according to Pickering and Kramers (2010), the duration of this deposition is uncertain. Herries and Shaw (2011) also undertook palaeomagnetic analysis of speleothems in the Sterkfontein Caves. Their study suggests that the STW 573 skeleton within Member 2 cannot be older than 2.58 My. This viewpoint is rejected by Bruxelles *et al.* (2014), who point out that all above dates on speleothems were on flowstones which were formed as infills within voids left by subsidence of breccia subsequent to the deposition of the hominin skeleton infill. A new study by Granger *et al.* (in press) now places Member 2 at well over 3 My.

Fauna represented in these deposits include cercopithecoids and remains of Felidae, Hyaenidae and Bovidae (Pickering *et al.* 2004a). Fossil cercopithecoid remains are the best represented skeletal elements within the Member 2 faunal assemblage, followed by Felidae skeletal elements (*ibid.*). In addition to an almost complete *Australopithecus* skeleton, there are articulating sets of specimens in the bovid and felid sub-assemblages. Due to their relative abundance in the infill, Member 2 is one of the deposits which points to the importance of fossil cercopithecids in the taphonomic history of the Sterkfontein cave fossil site. The abundance of fossil cercopithecid remains over felids in the deposit has implications for the taphonomic history of the infill.

### *2.1.3. Member 3*

This deposit lies beneath Member 4 and is exposed only within the Silberberg Grotto where it banked up against a large stalagmite boss that has since been removed by lime miners. It is one of the unexcavated deposits within the site. It is 8 metres thick and contains fossil faunal remains (Partridge & Watt 1991).

### *2.1.4. Member 4*

Member 4 is the deposit in which Broom (1936) found the first adult *Australopithecus* specimen. It is described as a huge underground chamber filling consisting of calcified and partly calcified deposits (Kuman and Clarke 2000). It accumulated in an underground cavern extending from east to west of the site, with a later phase extending further west (Robinson 1962; Kuman & Clarke 2000; Ogola 2009). This deposit has proved to contain a large number of fossil primates including *Australopithecus* fossils and other fauna (Kibii 2004). It was labeled 'Lower Breccia' by Robinson (1962), then Member 4 by Partridge (1978). Its stratigraphy is currently being investigated by Stratford and Bruxelles. Pickering and Kramers (2010) dated a Member 4 flowstone to between 2.65 ±0.30 and 2.01 ± 0.05 My. Palaeomagnetic analysis of Member 4 speleothem by Herries and Shaw (2011) suggests a date between 2.58 and 2.16 My. According to Bruxelles' ongoing research, however, all of the dated flowstones are post-depositional crack infills and therefore younger than the surrounding fossiliferous breccia (Clarke pers comm.).

### *2.1.5. StW 53 Infill*

This infill is situated south of the Member 5 deposits (Kuman and Clarke 2000). The StW 53 deposit dates between Member 4 and the Oldowan stone tool infill of Member 5; it is likely to be younger than 2.6 My and older than 2 My (Kuman & Clarke 2000). The deposit preserves the hominin cranium, StW 53, which bears cutmarks on the zygomatic arch consistent with deliberate disarticulation (Pickering *et al.* 2000). This, however, has

been challenged by Clarke (2013) who considers the cuts to have been made naturally by pressure of a sharp edged chert rock within the deposit.

### *2.1.5. Oldowan infill*

The Oldowan Infill developed through a centrally located vertical shaft (Kuman and Clarke 2000). The instability of the dolomite floor below this area appears to have led to the collapse of some of the Oldowan breccia into the underlying Name Chamber cavern (Clarke 1994; Kuman & Clarke 2000; Stratford 2008). The deposit is restricted to a 4 m (15 feet) horizontal surface, which suggests that the materials accumulated through a narrow vertical shaft. It preserves Oldowan style stone tools, various grassland fossil fauna remains (Pickering 1999) and lies at a level underlying the Acheulian infill. The Oldowan also preserves remains of *Paranthropus robustus* (Pickering 1999; Kuman & Clarke 2000)

### *2.1.6. Member 5 West*

The Acheulian deposits accumulated subsequent to the Oldowan infill across the western part of the site, but the best preserved breccia is Member 5 West (Kuman & Clarke 2000; Ogola 2009). This infill has Early Acheulean stone tools including two bifaces and some large flakes, as well as remains of *Homo ergaster* (*ibid.*).

### *2.1.7. Member 6*

Formerly known as the Upper Breccia (Robinson 1962), the Member 6 deposit filled a limited area between the dolomite roof and the underlying Member 5 breccia (Kuman & Clarke 2000). It preserves faunal remains belonging to the Orders- Primate, Artiodactyla and Carnivora (Ogola 2009), although primates are not common.

### *2.1.8. Post Member 6*

Subsequent to the deposition of Member 6, part of Member 5 was eroded in the northern area and left a channel that became filled with the post-Member 6 infill (*ibid.*). This infill, which bears Middle Stone Age artifacts, lies between the intact Member 5 West breccia and the eastern portion of Member 5 (Ogola 2009), which is not discussed here due to its poor context. Post Member 6 has remains of bushbuck, springbok, lechwe and waterbuck, (*ibid*.). The latter two species are water-dependent taxa, suggesting a swamp environment. Primate remains are the least represented fossil fauna in this younger infill.

### *2.1.9. Jacovec Cavern*

This cavern is located underground and seems unconnected to the main deposits. It is situated lower than and to the east of the main breccias exposed in the surface excavations (Wilkinson 1973). The cavern contains the deepest deposits in the Sterkfontein cave system consisting of an older orange breccia and a younger brown breccia (Partridge *et al.* 2003; Kibii 2000, 2004). The orange breccia has been dated by cosmogenic nuclide dating to ca. 4.02 ± 0.27 while the brown breccia was dated to ca. 3.76 ± 0.26 (Partridge *et al.* 2003). The dates are, however, no longer considered reliable by Darryl Granger who first calculated them (Clarke pers. comm.). Jacovec Cavern deposits preserve faunal remains belonging to the families Homininae, Cercopithecidae, Felidae and Bovidae (Kibii 2004). D. Stratford is currently conducting new excavations in this cavern and refining the stratigraphic interpretation.

### *2.1.10. Lincoln Cave*

The Lincoln Cave, which forms part of the Lincoln-Fault Cave System, is situated adjacent to the Sterkfontein Cave system (Reynolds *et al.* 2003). Two sections of the cave have been excavated: Lincoln Cave North and Lincoln Cave South. The excavated deposits have been dated using Uranium Series to between 252,600 ±35,600 and 115,300 ±7,700 years old on two flowstones present in Lincoln Cave North). These deposits,

which also contain intrusive fauna and artefacts eroded from Member 5, have yielded faunal remains belonging to *Homo ergaster*, four carnivore species (*Felis sp*, *Canis sp*., *Suricata sp*, and an indeterminate hyeana), four bovid species *Megalotragus sp.*, *Hippotragus sp*., *Tragelaphus scriptus* and an indeterminate small duiker (Reynolds *et al.* 2007). Some diagnostic MSA stone artefacts have also been excavated from the deposits in Lincoln Cave North (Reynolds & Kibii 2011), which undoubtedly was once joined with the Lincoln Cave South breccias prior to disturbance by lime miners (Reynolds *et al.* 2007).

## 2.2. The history of taxonomic classifications of the fossil cercopithecoids of the Sterkfontein Caves.

Research on the fossil cercopithecoid remains at Sterkfontein began in 1935 when T.R. Jones (1937) undertook the first known description of fossil primates from lime miners' blasting of what is now Member 4 in the Sterkfontein Caves. Since then large numbers of primate fossils have been uncovered at the site and numerous researchers have paid attention to fossil primate remains from the Sterkfontein deposits, which include the following provenances: Member 2 (Clarke, 1998; 1999; 2002; Clarke & Tobias 1995, Pickering *et al.* 2004a; Heaton 2006), Jacovec Cavern (Kibii 2000, 2004; Partridge *et al.* 2003); Member 4 (Broom 1936, 1937; Broom 1940; Freedman 1957; Freedman & Stenhouse 1972; Eisenhart 1974; Brain 1981; Delson 1984; Delson *et al.* 2000; Clarke 1988; Moggi-Cecchi *et al.* 1998; Elton 2001; Kibii & Clarke 2003; Pickering *et al.* 2004b; Kibii 2004; El Zaatari *et al.* 2005, Heaton 2006); Member 5 deposits (Hughes & Tobias 1977; Clarke 1994; Pickering 1999; Kuman & Clarke 2000; Pickering *et al.* 2000; Curnoe & Tobias 2006; Clarke 2008); as well as Member 6 and Post Member 6 (Robinson 1962; Ogola 2009) and Lincoln Cave (Reynolds 2000; Reynolds *et al.* 2007). Table 2.1 provides a synopsis of the fossil cercopithecoid taxa identified in southern African fossil cave sites.

Table 2.1.Cercopithecoid taxa identified in southern African fossil cave sites

| **Taxon** | **Type Site** | **Holotype** | **Reference** | **Appearance at other sites** |
|---|---|---|---|---|
| *Parapapio antiquus* | Taung | Sts 5364 | Haughton 1925 | N/A |
| *Parapapio broomi* | Sterkfontein M4 | Sts 564 | Jones 1937 | Makapansgat and Bolts Farm |
| *Parapapio jonesi* | Sterkfontein M4 | Sts 565 | Broom 1940 Freedman, 1957, 1970; Freedman and Brain, 1977 | Swartkrans, Taung, Kromdraai, and Makapansgat |
| *Parapapio whitei* | Sterkfontein M4 | Sts 563 | Broom 1940; Brain, 1981; Delson, 1984 | Taung, Swartkrans, Bolts' Farm and Makapansgat |
| *Papio izodi* | Taung | TP 7 | Gear 1926 | Sterkfontein |
| *Papio robinsoni* | Swartkrans | SK 555 | Freedman 1957 | Sterkfontein |
| *Papio angusticeps* | Kromdraai | KA 194 | Broom 1940 | Haasgat and Cooper's Cave, Minaar's Cave |
| *Papio spelaeus* | Pretoria | Unnumbered | Broom 1936 | N/A |
| Genus *Cercocebus* | | | Geoffroy 1812 | Sterkfontein |
| *Simopithecus (Theropithecus) darti* | Makapansgat | M 201,1326/1 | Broom & Jensen 1946 | Sterkfontein |
| *Simopithecus danieli sp nov* | Swartkrans | TMP 563 | Freedman 1957 | |
| *Theropithecus oswaldi* | Kanjera Kenya | BM A M 11539 | Andrews 1916 | Swartkrans; Sterkfontein and Hopefield |
| Genus *Dinopithecus* | | | Broom 1937 | |
| *Dinopithecus ingens* | Schuverberg, Pretoria | SB 7 | Broom 1937 | Swartkrans |
| *Gorgopithecus major* | Kromdraai A | | Broom & Robinson 1948 | N/A |
| *Cercopithecoides williamsi* | Makapansgat | AD 1326 | Mollet 1947 | Bolts Farm, Haasgat, Swartkrans and Sterkfontein |
| *Cercopithecoides haasgati* | Haasgat | HGD 1165 | Mckee *et al.* 2011 | Haasgat |

When Jones (1937) undertook the first analysis of fossil Cercopithecoidea at Sterkfontein Caves, he named the genus and species *Parapapio broomi*. Although he suggested the presence of a second species or genus within the collection, he did not identify the said taxon at the time (*ibid.*). Later, Broom (1940) analysed the Sterkfontein cercopithecoid collection and stated that the genus *Parapapio* consisted of three species: *Parapapio jonesi*; *Parapapio whitei* and *Parapapio broomi*. *Parapapio whitei* is the larger bodied of the three, and *Parapapio jonesi* is the smallest sized member (*ibid*.). Robinson (1952) referred to the presence of *Parapapio* in the Sterkfontein Lower Breccia (Member 4) and its absence in the nearby underground part of the cave known as the Graveyard site, which preserves *Papio* specimens indistinguishable from the modern *Papio ursinus*.

Freedman (1957) undertook a comprehensive study of the fossil cercopithecid primates. According to him, 550 cercopithecoid specimens from Sterkfontein were recorded in the 1950's (Freedman 1957). Of these, he noted, only half were studied and the other half were either very small or very badly damaged fragments which offered no clues to their taxa. Freedman was referring to cranio-dental materials which seem to have occurred in larger quantities compared to the postcranial specimens. According to his observation there were a few postcranial bones within the collection (*ibid*.). Freedman (1957) also undertook a metric assessment of the cranio-dental materials in comparison to extant *Papio ursinus*. He validated the presence of the three *Parapapio* species at Sterkfontein as initially suggested by Broom.

Eisenhart (1974) also produced a detailed assessment of the fossil cercopithecoid sample. He observed that the diversity of the Sterkfontein materials is greater than the identified *Parapapio* species as most of the studies relied on dental size which is an unreliable indicator for taxonomic classification when used without any other additional data. Some of the materials identified as *Parapapio* he demonstrated to be *Cercocebu*s remains and he also assigned some materials to the species *Papio wellsi* with characteristics similar to *Papio* specimens from Taung as initially identified by Freedman (Eisenhart 1974).

In the 1980s Delson undertook a different approach to determining taxonomic occurrences of fossil Cercopithecoidea at Sterkfontein and other African sites. He embarked on biochronological assessment of the African Plio-Pleistocene fossil cercopithecoids from which he made correlations between East and southern African fossil hominin sites (Delson 1984). The temporal framework applied in his study sought to create cercopithecoid faunal zonation based on co-occurrence of taxa. Twenty cercopithecoid taxa sequences and their geographic ranges were analysed, and the results demonstrated the presence of seven main zones defined by the presence of taxa and their relative frequency. Even though the framework is not best correlated to southern African fossil sites, fossil cercopithecoids from Stekfontein Member 4 were classified in the African cercopithecoid (AC) 3 zone or the *Parapapio* acme-zone (*ibid.*). This zone occurs around 2.5 My in East Africa, and is accompanied by *Theropithecus darti, Theropithecus brumpti, Cercopithecoides williamsi* and *Papio hamadryas robinsoni*. A smaller, unidentified *Papio* or *Cercocebus* which also occurs at Makapansgat Members 2 and 4 is linked to this *Parapapio* acme zone (Delson 1984).

In the late 1990s Pickering (1999) undertook a study of the fossil remains from the western portion of the Sterkfontein excavations in the StW 53 infill and the Member 5 deposits, and found that primate numbers are less represented than in the older infills. He referred to the presence of *Theropithecus oswaldi* which Clarke identified based on dental specimens. A number of taxonomically indeterminate cercopithecines was also recovered from both infills. Within the StW 53 deposit dental remains of *Cercopithecoides williamsi* were also identified (Pickering 1999). Around the same period in the late 1990s Clarke and colleagues examined faunal remains occurring in the Member 2 deposit. A distinct feature of this member is that cercopithecines form the bulk of the faunal remains in the deposit. This is a taphonomic issue which will be explored later in this thesis. Member 2 has yielded a large concentration of fossil cercopithecid remains and one complete skeleton of an *Australopithecus*, a mandible belonging to the extinct *Cercopithecoides williamsi*, and several crania belonging to *Parapapio jonesi*, *Parapapio broomi* and *Papio izodi* (Clarke 1998, 1999, 2002; Pickering *et al*. 2004a). At the turn of the 21$^{st}$ century fossil faunal remains from Jacovec Cavern were analysed by Kibii

(2000). Three hundred thirteen cercopithecoid cranio-dental and postcranial specimens belonging to fossil cercopithecoids were recorded. Kibii's analysis of the fossil cercopithecoid cranio-dental material identified the presence of four species*: Parapapio jonesi*, *Parapapio broomi*, *Papio izodi*, and a colobine as well as a taxonomically indeterminate cercopithecine.

Later Heaton (2006) reassessed taxonomic classifications of the Sterkfontein Cercopithecinae, in particular the tribe Papionini of Members 2 and 4. The study entailed a cranio-dental classification of fossils within the *Papio* and *Parapapio* genera and the intra and inter-specific variation thereof. Heaton (2006) noted the fragmentary nature of the Sterkfontein sample and that, despite many years of excavation, many of the elements recovered still remained too fragmentary to have a larger sample identified to the lowest taxonomic level, i.e. species level. Heaton's (2006) cranio-dental taxonomic categorization included quantitative and qualitative analysis of the sample. This study concluded that the fossil cercopithecoid species composition in Members 2 and 4 is similar and that only two species of *Parapapio* and one of *Papio* exist in Sterkfontein Members 2 and 4-*Parapapio broomi*, *Parapapio jonesi* and *Papio izodi*. Much younger than Members 2 and 4 are some deposits in Lincoln Cave adjacent to the main Sterkfontein cave system. Lincoln Cave preserves scant primate remains. In the two identified Lincoln Cave deposits (Lincoln Cave North and South) only five fossil cercopithecoid postcranial specimens were preserved (Reynolds 2000; Reynolds *et al.* 2003, 2007).

All the above taxonomic assignments were based on cranio-dental identifications and none attempted to identify the fossil Cercopithecoidea postcrania to taxa (Table 2.2). There are to date two studies by Elton (2000, 2001) and Ciochon (1993) which have examined some of the Sterkfontein fossil cercopithecoid postcrania. Of these two Elton (2000) provided a habitat classification of the specimens, and Ciochon (1993) assigned the specimens taxonomically.

Table 2.2. Fossil cercopithecoid taxa identified in the Sterkfontein deposits based on crania and dentition.

| **Taxa** | **M2** | **Jacovec** | **M4** | **StW53** | **Oldowan** | **M5West** | **M6** | **Lincoln** |
|---|---|---|---|---|---|---|---|---|
| *Papio sp* | | | x | | | | | x |
| *Papio izodi* | x | x | x | | | | | |
| *Parapapio broomi* | x | x | x | | | | | |
| *Parapapio jonesi* | x | x | x | | | | | |
| *Parapapio whitei* | | | x | | | | | |
| *Theropithecus oswaldi* | | | | x | x | | | |
| *Cercopithecus sp* | | | | | | | x | |
| *Cercopithecus aethiops* | | | | | | x | | |
| *Cercopithecoides* | | x | x | | x | x | | |
| *Cercopithecoides williamsi* | x | | x | x | | | | |
| *Colobinae indet* | | | x | | | | | |
| *Colobus sp* | | x | | | | | | |

## 2.3. Taxonomic re-assessments of some Sterkfontein fossil cercopithecoids.

Taxonomic classification of fossil specimens is an on-going exercise which relies heavily on availability (quality and quantity) of data to support the conclusions. As the Sterkfontein fossil fauna has been collected and studied for over eighty years it should be expected that the inventory of the specimens and the context of the fossil assemblage have changed over time, impacting on various taxonomic interpretations. The section below delves into the taxonomic status of fossil Cercopithecoidea occurring at Sterkfontein Caves and how these have transformed and, in some cases, resulted in re-classification of materials or assemblages. Table 2.3 provides a summary of these. The details of this debate in relation to papionini occurring in Sterkfontein Members 2 and 4 can be found in Heaton (2006). The history of taxonomic assignments of fossil cercopithecids at Sterkfontein, as at other sites, demonstrates that differing views on classification are a reflection of the availability and or paucity of diagnostic samples as well as trends in classification systems. Five genera which have been named at Sterkfontein Caves are discussed. It is these currently accepted assignments which will be followed in this study. The following taxonomic scheme will be pursued-for the genus *Cercopithecoides*, *Cercopithecoides williamsi* will be adopted; where, and if applicable, *Procercocebus antiquus* is recognized as suggested by Gilbert *et al*. (2016) and *Parapapio whitei* will be classified into *Parapapio broomi;* the only fossil *Papio* recognised is *Papio izodi;* specimens previously referred to as *Simopithecus* will be classed as *Theropithecus;* the genus *Dinopithecus* is not recognized at Sterkfontein*; Gorgopithecus* has not been described at Sterkfontein, as a result, it does not form part of discussion.

### *2.3.1. Genus Ceropithecoides Mollet, 1947*

The taxon *Cercopithecoides molletti* was first assigned to fossil colobine specimens from Swartkrans by Freedman (1957). He designated a new species because of morphological and size variation. However, it was later considered that the variation in dental specimens from the Swartkrtans and Makapansgat assemblages pointed to intraspecific variety rather than a separate species (Freedman 1960). *Cercopithecoides molletti* thus has subsequently been classified as *Cercopithecoides williamsi* (Freedman 1960; Frost & Delson 2002).

*2.3.2. Genus Parapapio. Jones 1937*

Subsequent to Jones' (1937) naming of the species *Parapapio broomi*, other new species of this genus were assigned based on dental size variation. Eisenhart (1974) however found that there was an overlap in dental dimensions between some of the Sterkfontein cercopithecoids, emphasizing that dental size alone was not an accurate criterion for species identification. Moreover, Eisenhart (1974) observed that dental variations observed in these samples are not congruent with observed cranial variations. All of this information was later examined by Heaton (2006) in his doctoral thesis which undertook to re-assess taxonomic assignments of Papionini from Sterkfontein Member 2 and Member 4. In his study, Heaton concluded that *Parapapio broomi* demonstrated more variability than had been previously considered. He invalidated *Parapapio antiquus* and *Parapapio whitei* as independent species and included them as subspecies of *Parapapio broom*i. Gilbert (2007), however, rejected this conclusion on the basis that Heaton did not include extant taxa in his study. According to Gilbert (2007; 2013), fossils classed as *Pp. antiquus* have more affinities to the early *Cercocebus* lineage than to *Parapapio* and should thus be removed from the latter genus. Jablonski and Frost (2010) argue that *Pp antiquus* shares affinities with *Cercocebus* and Mandrills and they also assign it to the *Cercocebus* lineage (*Procercocebus*).

Even though other scholars have provided distinguishing characteristics between *Parapapio whitei* and *Parapapio broomi* (e.g. Freedman 1957; Szalay & Delson 1979), Heaton (2006) invalidates *Parapapio whitei* and suggests that its type specimen, Sts 563, shares more affinities with male *Parapapio broomi*. According to Heaton (2006), specimens representing *Papio hamadryas robinsoni* were erroneously assigned to this species based on large dentition identified in the post-1966 sample without other supporting characteristics. Taxonomists were lumping specimens based on ambiguous traits, size and locality with limited classification methods and sample sizes. Specimens previously assigned to *P. hamadryas robinsoni* have subsequently been assigned to either *Parapapio broomi* or *Papio izodi* (Heaton 2006). Contrary to Heaton's analysis, Jablonski and Frost (2010) recognize the presence of *P. robinsoni*, in addition to *P. izodi* and *P. angusticeps*. They argue that *P izodi* is a distinct species from modern *P. hamadryas* and *P. robinsoni* is a subspecies of the living *P. hamadryas*.

### *2.3.3. Genus Papio. Erxleben 1777*

Since most materials from Sterkfontein had been identified as *Parapapio*, Eisenhart's (1974) study indicated more variability in the fossil cercopithecoid sample and suggested the presence of a different species at Sterkfontein. Some of the materials he noted to share affinities with cranio-dental remains that had been previously identified at Taung, *Papio wellsi*. The identification of this species at Sterkfontein has since been questioned due to lack of convincing characteristics on identified specimens and they were re-assigned to *Papio izodi* (Szalay & Delson 1979; McKee 1993).

### 2.3.4. Genus *Simopithecus/Theropithecus.* Andrews 1916

*Simopithecus oswaldi* was first described by Andrews (1916) based on dental remains from Homa (Kanjera), Kenya. Andrews was the first author, in 1916, to demonstrate similarities in tooth morphology between *Simopithecus* species and the extant *Theropithecus gelada* (Maier 1972). Maier (1970, 1972) and Jolly (1970, 1972) considered that *Simopithecus* and *Theropithecus* show the same specialization and share many significant features. Maier (1972) contended that the two genera be retained as separate genera within a related lineage. However, there is now consensus *Simopithecus* should be classed within the genus *Theropithecus* (Jolly 1972; Freedman 1976). Jablonski and Frost (2010) argue that *Theropithecus* derives from a papionin ancestor around 3.5Ma and 4 Ma.

### 2.3.5. Genus *Dinopithecus.* Broom 1937

*Dinopithecus* was initially described from Schurveberg 1, in the then Transvaal (South Africa) by Broom (1937). Some fossils from Swartkrans Member 1 were later assigned to this genus and noted to exhibit large rugged skulls with considerable sexual dimorphism and fairly long muzzles in the females (Freedman 1957). The use of this taxon was abandoned and materials assigned to this genus from Omo are now placed in *Theropithecus* (Simons & Delson 1978). Later assessments of this genus suggest that *Dinopithecus* has affinities to *Papio quadratirostris* and should be included in the *Papio* genus as a sub-species (Delson & Dean, 1993). Although Gilbert (2013) finds that there is little similar morphology to link *Dinopithecus* to the

*Soromandrillus quadratirostris* clade (with *Mandrillus*/*Cercocebus*/*Procercocebus*) or the *Theropithecus* clade, he argues that *Dinopithecus* is a stem African papionin.

2.3.6. Genus *Gorgopithecus*. Broom & Robinson 1949

The type specimen for this genus is *Gorgopithecus major* identified at Kromdraai A (Broom & Robinson 1949). It is a medium to large sized papionin. Recently the genus has been identified at Olduvai Gorge in Tanzania among fossil remains previously identified as cf. *Papio* sp (Gilbert *et al.* 2015).

Table 2.3. Taxonomic reassignments of fossil Cercopithecoidea which have been recorded at Sterkfontein Caves

| **Genus/Species** | **Conclusion** | **Re-assignment** | **Reference** |
|---|---|---|---|
| *Parapapio antiquus* | Not the same as *Parapapio* | *Cercocebus* lineage | Gilbert 2007, 2013 and 2016; Jablonski & Frost 2010 |
| *Papio hamadryas* | Subspecies of *P. robinsoni* | *P. hamadryas robinsoni* | Jablonski & Frost 2010 |
| *Parapapio whitei* | Invalidated | *P. broomi* | Heaton 2006 |
| *Parapapio makapania* | Invalidated | *P. broomi* | Freedman 1957 |
| *Parapapio angusticeps* | Not *Parapapio* | *Papio angusticeps* | Freedman 1957; Jablonski & Frost 2010 |
| *Papio spelaeus* | Same morphology as *P. ursinus* | *Papio* cf. *ursinus* | Freedman 1975 |
| *Papio robinsoni* | Invalidated | *Papio izodi and Parapapio broomi* | Heaton 2006 |
| *Papio wellsi* | Invalidated | *P. izodi* | Szalay & Delson 1979; Mckee 1993 |
| *Cercopithecoides molletti* | Re-assigned to *C. williamsi* | *C. williamsi* | Freedman 1961 |
| *Simopithecus* | Same genus as *Theropithecus* | *Theropithecus* | Stark & Frick 1958; Maier 1972 |

## 2.4. Analysis of the Sterkfontein cave fossil cercopithecoid postcrania

Some approaches have been applied which have provided an indication of the taxonomic variation of some of the non-hominin fossil primate postcrania at Sterkfontein Caves. Two prominent studies have used discriminant functional analysis and taxon free analysis. These research projects sampled some of the Sterkfontein fossil cercopithecoid postcrania to determine either the taxa or habitat preferences based on locomotor data derived from limb elements. These studies form the foundation for fossil cercopithecoid postcrania taxonomic investigations at Sterkfontein Caves.

*a) Discriminant function analysis*

Ciochon (1993) undertook a multivariate analysis of postcrania of southern African fossil Cercopithecoidea and described functional and systematic differences in the extant cercopithecoid forelimb. The study entailed application of standard and novel multivariate statistical techniques to quantify patterns of variation in the forelimb of 20 species of living and extinct cercopithecoids. In this analysis he noted that even though the law of closest living relative is applied to his study, Pliocene taxa share little affinity to any extant members of his comparative sample.

Ciochon (1993) analysed 27 postcranial elements from Sterkfontein Member 4 and other materials from Makapansgat, Taung, Swartkrans and Kromdraai. His results suggest the presence of some previously un-identified taxa within the Sterkfontein Caves. Some of his results resonate with Eisenhart's 1974 study and also correlate with Delson's (1984) conclusions on biochronological assessment of Sterkfontein fossil Cercopithecoidea. From the 27 elements studied from Member 4, Ciochon (1993) identified five genera (*Theropithecus darti*, *Papio cf robinsoni*, *Parapapio indet*, *Cercopithecoides* and *Cercocebus sp*). *Theropithecus darti* is the peculiar one which had not been previously identified at Sterkfontein prior to this study.

Ciochon (1993) identified an early form of *Papio* which he states had been previously misidentified as a *Parapapio,* and he classified one skeletal element, STS 1087, as *Cercocebus*, a genus which had also been previously identified by Eisenhart on cranial fossils. Ciochon (1993) identified *Papio cf robinsoni* from the postcrania and *Theropithecus darti* which had not been previously identified at Sterkfontein.

*b) Taxon free analysis*

Elton (2000) undertook a locomotor and habitat classification study by examining post-cranial morphology of the fossil cercopithecoids of Sterkfontein Member 4, Bolt's Farm and Swartkrans. She employed a taxon-free multivariate study in which statistical discriminant function study was used to determine variation between bony elements which would ultimately determine the variability in habitat and locomotor preferences (Elton 2000, 2001). Although the

study did not necessarily assign the specimens to taxonomic groups, the habitat and locomotor data derived are useful in determining the ecology of the area. The habitat categories identified are: 'forest arboreal', which relates to forest living quadrupeds; 'open mixed' suggesting a mix of arboreal and terrestrial quadrupeds; and open habitat quadrupeds represented by the 'open terrestrial' category.

The bony elements used were the proximal and distal humerus, the proximal ulna, and the distal femur (Elton 2000, 2001). Only 'well preserved' specimens were included in the analysis which therefore excluded much of the Sterkfontein non-hominin fossil primate postcrania. Twenty five specimens from Sterkfontein were assigned to the following habitat categories: four to 'forest arboreal' 15 to 'open mixed' and six to 'open terrestrial'. The highest percentage of locomotor type discovered from Sterkfontein Member 4 was assigned to the 'open mixed' category. Due to the limited sample in the study, Elton used the percentages of categories only to suggest the presence of habitat types found during accumulation of Member 4, and thus there might not necessarily be a complete representation of the Sterkfontein Member 4 fossil monkey habitat. These two studies provide a sample of fossil Cercopithecoidea taxa and habitat preferences available in the Sterkfontein cave sites. Of the two, Ciochon's study demonstrates the importance of functional elements as possible taxonomic indicators which can provide data not yet derived from cranio-dental remains.

### 2.5. Form and function as indicators of locomotor and positional behavior

To date, little is known about the degree to which taxonomic assignments can be made to isolated postcranial skeletal elements (Elton *et al.* 2003, Patel *et al*. 2007). Skeletal remains with identifiable morphological traits are the only evidence which can be used to make interpretations on function, behaviour and, where comparative materials exist, related taxonomic links. Limb elements particularly are the main postcranial skeletal parts which can shed light on the subject.

Even in light of the little evidence which shows the degree to which taxonomic assignments can be made to fossil cercopithecoid postcranial elements, studies have been undertaken which examine the monkey's behavioural preferences. Such data enables researchers to make inferences about the locomotor behavior of fossil remains from skeletal shape variations that are

associated with behaviour, which can then be used to interpret the palaeobiology of fossil primates.

Various postcranial elements have been utilised to theorize on monkey locomotor preferences. Rein *et al* (2015) established a predictive model which can be applied to infer significance of behaviours. They were able to demonstrate that shape exploration and predictive analysis can be applied to limb bones and to other positional behaviours in order to uncover those aspects In their field study of locomotor patterns for extant new world monkeys, Youlatos and Meldrum (2011) utilise the talus to hypothesize that platyrrhine species have ecological niches. They found that these monkeys have a range of locomotor adaptations. This ranges from small bodied monkeys with morphological adaptation for claw climbing and leaping, medium sized variation with adaptation for generalised locomotion and large bodies animals with adaptation for climbing and suspension (Youlatos & Meldrum 2011). Ruff (2002) established the relationship between long bone epiphyses and diaphyses structural proportions and found that movement or limb positioning is related to long bone structure. Species with slow cautious movements have larger articular to cross section shaft proportions and species with more forelimb suspensory movements show relatively larger and stronger forelimbs while stronger and or larger forelimbs are observed in species with an emphasis on leaping; however, structure and function did not always covary with taxonomy (Ruff 2002, 2003). Ruff (2003) also indicates that some morphological dimensions, such as the medio-lateral breadth of the proximal tibia are not the best locomotor predictors. In the context of Sterkfontein fossil cercopithecoid postcrania, this lack of direct correlation between structure/function and taxonomy suggests that isolated postcrania can be linked to function, however, taxonomic assignments have to be made independently of functional or behavioural assumptions. A study of locomotor differentiation in mangabey morphology demonstrates that limb anatomy, particularly in the humerus and femur, shows differences between arboreal and terrestrial species (Nakatsukasa 1996). The same variation is found in colobine limb morphology. Egi *et al*.'s (2007) study of the distal humerus and ulna of *Parapresbytis*, a colobine from the Russian Pliocene, showed structural differences between terrestrial colobines. According to Gebo (1993) all arboreal cercopithecoid monkeys are secondarily arboreal as few adaptations can be seen in the foot. He asserts that old world monkeys were arboreal, went through a terrestrial phase and regained arboreality recently (Gebo 1993).

## 2.6. Inferring taxonomy on isolated postcranial elements

Ruff's (2002) analysis has indicated that structure and function do not always covary with taxonomy. However, there is a link which can be made between specific taxa and a suite of characteristics which can enable estimations to be made on taxonomic affinities. Analysis of morphological variations and morphometric relationships and establishing exclusions enables calculated assumptions to be made on the taxonomic affinities of skeletal elements. The discovery of fossil cercopithecoid postcranial skeletal remains associated with cranio-dental remains in East African sites provides a foundation for these taxonomic approximations.

As observed by Ciochon (1993), limb elements make valuable contributions to the understanding of phyletic affinities and palaeoecology of extinct primates and, due to their functional significance, are a good basis for taxonomic investigations. Due to the relatively higher frequency of isolated cercopithecoid limb elements in the Sterkfontein fossil faunal assemblage, the current research thesis will focus on limb elements discovered at the site and their usefulness as gauges for taxonomic classification.

Two approaches will be undertaken to provide a thread between isolated postcranial elements and taxonomy. Independent assessments of the limb elements to make correlations to their functional significance and associated behavior will be the first methodological approach.

Comparative methods make it possible to test the correspondence between skeletal traits and locomotor behaviour across a wide range of species while taking into account potential phylogenetic features (Spoor *et al.,* 2007). They allow inferences about individual behaviours that make up a locomotor profile, based on the most reliable indicators for behaviour (e.g., Silcox *et al.,* 2009). A comparative analysis will elucidate whether the extent to which form and associated function relate to the taxonomy of the fossil elements.

In the southern African context, fossil cercopithecoid postcranial remains have played little role in understanding taxonomic affinities, and in turn, phylogeny of the primates in the region. The abundance of fossil primate remains in the Sterkfontein deposits suggests that a large amount of data is missing from the understanding of the evolution of primates in South Africa. This has, in turn, led to reliance on data from other parts of the continent to determine a more comprehensive

picture of the evolution of the fossil cercopithecoids in southern African sites. Data on the taxonomy of the postcrania will contribute to providing a more holistic overview of the Plio-Pleistocene ecosystem in the Sterkfontein valley area.

Studies have indicated that elbow joints are useful in identifying variation in primate locomotor modes and thus useful in taxonomic identification (Nakatsukasa 1994, 1996; Ruff 2002, 2003; Drapeau 2008; Patel 2007). In addition, authors such as Jablonski *et al.* (2008) developed comprehensive landmark analysis data to evaluate variation in species occurring at Koobi Fora. Other authors have provided detailed morphological descriptions of fossil cercopithecoid postcrania which occur in the African Plio-Pleistocene fossil record. Frost and Delson (2002) have described postcranial remains of *Theropithecus*, *Parapapio*, *Rhinocolobus*, *Cercopithecoides meaveae* and *Cercopithecoides kimeui* from Hadar, Ethiopia. Harrison (2011) has illustrated fossil cercopithecoid remains of *Parapapio ado*, *Parapapio* sp., *Cercopithecoides* sp. and *Rhinocolobus* sp. from Laetoli in Tanzania. Nakatsukasa (1994) provides a detailed analysis of *Cercopithecus* and *Cercocebus* limb bone elements which occur in African sites.

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | *Parapapio.* Jones 1937 |

*Parapapio* is a small to medium sized fossil papionin which occupied South and East Africa during the Pliocene. The smallest of the *Parapapio* genus in southern African fossil caves, *Pp jonesi* females from Sterkfontein are estimated to have weighed between 9.5kg and 13.5kg while their male counterparts are estimated at 14kg and 20kg (Delson *et al.* 2000). The fossil *Parapapio cf jonesi* sample from Hadar also has size ranges similar to the southern African fossils. *Parapapio whitei* specimens from Makapansgat, which Heaton (2006) recently assigned to male *Parapapio broomi*, suggest that it was heavier. Males belonging to *Pp. broomi* are estimated to have weighed between 20kg and 30kg (Delson *et al*. 2000). *Parapapio ado* from Laetoli is estimated to have been similar in weight to *Parapapio jonesi;* males are approximated to have weighed between 17kg and 25kg while females range between 10kg and 14kg (*ibid*.).

Unlike *Papio, Parapapio*'s fossil history is relatively better known and postcranial remains of *Parapapio* species (*ado* and *jonesi*) have been identified, particularly in East African sites such as Laetoli (Leakey & Delson 1987; Harrison 2011), Koobi Fora (Jablonski, Leakey & Anton 2008) and Hadar (Frost & Delson 2002). In South African sites fossil *Parapapio* cranio-dental materials have been intensely studied (e.g. Freedman 1957; Thackeray & Myer 2004; Heaton 2006). However, very few studies have focused on postcranial remains. Known research on fossil *Parapapio* postcrania in South Africa is based on material studied by Gommery *et al.* (2008) from Bolt's Farm Waypoint 160 and fossil remains from Cooper's Cave (De Silva *et al.* 2013). Bolt's Farm *Parapapio* postcranial material is preserved in the same breccia block with dentition belonging to the same genus and is presumed to belong to the same individual (Gommery *et al*. 2008). This occurrence is a rarity in the South African fossil cave sites.

Conclusions on *Parapapio sp.* postcrania from Waypoint 160 suggest that it was a terrestrial to semi-terrestrial monkey. *Parapapio ado* skeletal remains from Laetoli also indicate that the species was a slender and agile semi-terrestrial monkey (Harrison 2011). Koobi Fora *Parapapio* anatomy points to their generalist nature in terms of habitat; the elbow joints in these specimens

lack extreme arboreality or terrestrially adapted morphology while cranio-dental material points to a generalist herbivore diet (Jablonski & Leakey 2008). *Parapapio* fossil remains from Bolt's Farm, specimens WP1 and WP2, are considered but are too fragmentary to be used for comparison in this study.

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | *Papio.* Eerxleben, 1777 |

*Papio* is a medium to large terrestrially adapted cercopithecoid. According to a body mass index study undertaken by Delson *et al.* (2000), the estimated body mass from the dentition of specimens previously assigned to *Papio hamadryas robinsoni* from Bolt's Farm ranges between 22kg and 34kg in males and 15kg and 23kg in females. Average weights of fossil *Papio izodi* are estimated at 22kg for males and 17kg for females (*ibid.*). Their East African fossil counterparts are estimated to have higher body mass. Male *Papio quadratirostris* from Omo, Ethiopia and Leba in Angola average between 30kg and 53kg while the weight of females is estimated to be between 16kg and 25kg (Delson *et al.* 2000). Locomotor assignment of *Papio* is to a ground stander and walker (Rose 1973). Modern *Papio* occupies a wide variety of environments in Africa, including gallery forest, rainforest, thorn scrub, semi-deserts, grassland and woodland savannas (Rowe 1996; Codron *et al*. 2005). Its functional anatomy demonstrates adaptation towards a terrestrial habitat.

Modern baboons are generally opportunistic feeders with a high variability of diets across the continent (Codron *et al.* 2005). Codron *et al.* (2005) suggest that *Papio h. robinsoni* from Swartkrans Member 1 and 2 primarily subsisted on a diet of fruits, and leaves were a secondary food source. *Papio (Dinopithecus) ingens* from Swartkrans Members 1 and 2 consumed more fruits than leaves. Therefore compared to its modern counterparts such as *Papio ursinus*, fossil *Papio* had a greater utilisation of grass foods and more variability in diet. The suggested faunal age of the Swartkrans Member 1 *Papio* fossils is between 1.9Mya and 1.8Mya (Pickering *et al.* 2012), or possibly slightly older (Gibbon *et al*. 2014).

The fossil history of *Papio* is not as well known as that of other papionins. A few sites are currently known to preserve *Papio* fossil remains in the Middle Pleistocene (Szalay & Delson, 1979; Kalb *et al.*, 1980; Jablonski, 2008). Even fossil-rich East African sites such as Koobi Fora and Hadar rarely preserve fossil *Papio* remains (Frost & Delson 2002; Jablonski *et al.* 2008). The rarity of identified fossil *Papio* postcrania from other sites significantly impacts on this

research and has led to a reliance on modern *Papio* remains for comparison with the Sterkfontein fossils.

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | *Theropithecus.* |

*Theropithecus* is one of the most studied non-hominin fossil primate genera in Africa. Its abundance in the East African fossil sites makes it one of the most well known fossil cercopithecoids. *Theropithecus* fossil remains are known from sites such as Olduvai Gorge (Hopwood 1934; Leakey 1965), Olorgesailie (Jolly 1972; Leakey & Leakey 1973, Shipman, Bosler & Davis 1981), Koobi Fora (Leakey 1976; Jablonski, Leakey & Anton 2008), Lomekwi in West Turkana Kenya (Jablonski *et al.* 2002), Luangwa Valley, Zambia (Elton *et al.* 2003), Hadar and Omo in Ethiopia (Eck 1976; Frost & Delson 2002) Afar in Ethiopia (Frost *et al.* 2014). In South Africa, *Theropithecus* has been identified in Sterkfontein (Pickering 1999), Swartkrans (Freedman 1957; Freedman & Brain 1977), Makapansgat (Maier 1972) and tentative assignments to this genus have been made on some specimens from Coopers Cave (De Silva *et al.* 2013). Sterkfontein preserves a very limited sample of *Theropithecus* with only two individuals identified from the StW53 breccia and the Oldowan Infill (Pickering 1999; Kuman & Clarke 2000).

The fossil genus is comprised of two groupings: *Theropithecus darti* connected with *Theropithecus oswaldi*, and *Theropithecus brumpti* and its predecessors (Jablonski 1993). *Theropithecus gelada* is an extant form, the fossil history of which is generally unknown (*ibid.*). *Theropithecus* is a large (weighing between 20kg and 43 kg), heavily built and sexually dimorphic papionin (Delson *et al.* 2000; Jablonski *et al.* 2002). The genus shares a number of traits with *Papio* suggesting close alignment in locomotion and posture (Krentz 1993). Modern *Theropithecus* has the ability to manipulate objects and is characterized by ground standing and walking (Rose 1974). As observed by Krentz (1993), *Theropithecus gelada* and *Theropithecus oswaldi* share more similar postcranial morphology than either does with *Theropithecus brumpti*. *Theropithecus oswaldi* demonstrates features of a terrestrial quadruped with shuffling behaviours and an opposable thumb for manual foraging (Krentz 1993). *Theropithecus brumpti* differs from other theropithecines in that it possesses a suite of characters which suggest that it spent some time in trees (Krentz 1993). According to Jablonski *et al.* (2002), *T. brumpti* was also adapted for

propulsive locomotion. In East Africa *T. darti* is represented by small sample sizes and its locomotor tendencies are not as well known (Krentz 1993). From the known postcrania, East African *T. darti* was the smallest species of the genus, had a stable shoulder joint, opposable first and second digits and was also a generalised terrestrial quadruped which spent time in trees (*ibid*.).

Criticism has been leveled against Krentz' (1993) taxonomic identification of *Thereopithecus brumpti*. The postcranial specimens from the Shungura Formation that he assigned to different species of *Theropithecus* were not directly associated with cranio-dental material (Guthrie 2011). His description of *Theropithecus brumpti* as arboreal has been disproved by recent discoveries. *Theropithecus brumpti* forelimb and hindlimb remains from Tugen Hills and West Turkana suggest that the species was terrestrially adapted, similar to modern *Papio* and was capable of moving in tress (Jablonski *et al*. 2002, Gilbert *et al*. 2011).

El Zaatari *et al.* (2011) suggest that fossil *Theropithecus oswaldi* had a different diet from extant *Theropithecus gelada*. Microwear data extracted from fossil *Theropithecus* specimens from Swartkrans indicate a diet which includes grass, leaves and fruit unlike modern *Theropithecus gelada* which is a grass and leaf eater (El Zaatari *et al.* 2011). *T. darti* on the other hand could have been mainly subsisting on grasses and leaves (*ibid*.).

Subfamily Cercopithecinae Gray 1821

Tribe Cercopithecini

Genus *Cercopithecus* sp. Brunnich, 1772

Jablonski, Leakey & Anton (2008) suggest that fossil *Cercopithecus* is best represented at Koobi Fora. Even though this site represents the best evidence of *Cercopithecus*, the fossil remains for this genus are rare and the reasons for their rarity are yet to be explored (Jablonski, Leakey & Anton 2008). *Cercopithecus aethiops* has been assigned to fossil cercopithecid remains occurring in the Post Member 6 Infill at Sterkfontein (Ogola 2009). These assignments were based on the presence of *C. aethiops* cranio-dental remains.

*Cercopithecus* is a small cercopithecine, a guenon, the females of which weigh between 3.5 kg and 4.5kg and males weigh between 4.5kg and 7.5kg (Delson *et al.* 2000). All guenons use arboreal environments, but diversity in the use of arboreal substrates is apparent (Gebo & Sargis 1994). *Cercopithecus aethiops* is a quadruped classified as a 'branch sitter and walker' and is an open woodland terrestrial guenon (Napier & Napier 1967; Rose 1973). The species, however, has been found to 'exhibit fewer morphological adaptations characteristic of a terrestrial lifestyle' (Gebo & Sargis 1994:1). It retains arboreal features while demonstrating that it frequents terrestrial substrates (Gebo & Sargis 1994; Nakatsukasa 1994).

Subfamily Colobinae Jerdon 1867
Tribe Colobini Blyth 1875
Subtribe Colobina
Genus *Cercopithecoides.* Mollet 1947

*Cercopithecoides williamsi* is the most commonly occurring fossil colobine in South African fossil cave sites. It is a large fossil colobine with females thought to have weighed an average of 15kg and males weighing 21kg on average (Delson *et al.* 2000; Jablonski *et al.* 2008). Postcrania belonging to *C. williamsi* have been identified at Koobi Fora by Jablonski *et al.* (2008). Postcrania belonging to this species demonstrate a colobine with full adaptation to terrestrial locomotion and posture (*ibid*.). It bears relatively long forelimbs and hindlimbs compared to *Papio*. The long bones also demonstrate an emphasis on flexion, extension movements during locomotion and a highly flexible hip joint (Jablonski *et al.* 2008).

Dental microwear studies on *C. williamsi* from Koobi Fora suggest that this colobine subsisted on unripe fruits and young leaves (El-Zaatari *et al.* 2005; Jablonski *et al*. 2008). Isotopic composition of *C. williamsi* material from Sterkfontein Member 4 and Swartkrans Members 1 and 2 indicate that the species spent considerable time foraging on a terrestrial substrate (Codron *et al*. 2005). In South Africa a new species of *Cercopithecoides* has been named from cranio-dental specimens, *C. haasgati* (McKee *et al.* 2011). The morphology demonstrates variation from known South African and East African *Cercopithecoides* and it is relatively smaller (*ibid.*).

## 2.7. Spatial distribution of fossil cercopithecids at Sterkfontein Caves

Patterns of spatial distribution of fossils in cave systems such as Sterkfontein are crucial for taphonomic assessment, palaeoenvironmental reconstruction, and site formation processes during and subsequent to deposition of the infills. Sterkfontein cave site formation is of particular interest due to the complex nature of the history of deposition of the infills.

Jacovec Cavern is a deep cave bearing deposits at a depth of at least 30 meters (Wilkinson 1973). It has three components: an older, hominin-bearing *in situ* hanging remnant in the cavern which is the orange breccia; a younger brown breccia visible as a talus cone; and a mixed brown and

orange breccia in the floor of the cavern resulting from the collapse of both breccias (Partridge *et al.* 2003, Kibii 2004, Reynolds & Kibii 2011). Member 2 lies within the Silberberg Grotto above the oldest Sterkfontein deposit, Member 1 (Partridge 2000). The deposit is a talus cone oriented northeast to southwest.

Kuman and Clarke (2000) investigated stratigraphic associations of the Sterkfontein Member 4-5 infills by analyzing the taxa represented in the according to their distribution in space relative to site plan (Figure 1), which is divided into squares by yard. They discovered that there are inherent patterns that distinguish different infills, and these patterns also provide some insight into the taphonomic history of the site and relationships of the deposits.

Previously, Clarke (1985) had plotted the distribution of the hominins and artefacts within Member 4 and 5 and suggested that they demonstrate a pattern. The distribution in Member 4 suggests that the infill possibly accumulated through different phases, with the southern end likely deposited later than the rest of the infill, and possibly under different conditions (Partridge & Watt 1991; Moggi-Cecchi *et al.* 1998; Kuman & Clarke 2000). Later, Ogola (2009) determined that Member 4 extends to the western and southern end of the cavern where it was covered by a stalagmite curtain. The Member 5 deposits lie against this curtain (Ogola 2009).

The StW 53 Infill is a hanging remnant of Member 4 against the south wall of the surface exposures and in the western area of the breccias excavated at surface. The *Australopithecus* cranium StW53 was found partially in solid breccia forming the wall of a solution pocket and partially in decalcified breccia within the solution pocket (Hughes and Tobias 1977; Pickering 1999). Further east within the site, such decalcified pockets of this infill were removed during excavations by Hughes and Tobias (Kuman & Clarke 2000).

The Oldowan deposit lies within the eastern portion of the Member 5 deposits from ca 22 feet below datum and occupies cavities and erosion channels from the collapse of Member 4 in that area (Kuman & Clarke 2000). The Member 5 West deposit, like the Oldowan Infill, also occurs within similar cavities but in the western part of the Member 5 deposits (Kuman & Clarke 2000). These deposits are covered by a flowstone ‘cap’ in the north-western end (Robinson 1962; Ogola 2009).

The Member 6 deposit lies on top of this flowstone that caps Member 5. The Post Member 6 deposit is preserved today in the northern section of the site, just east of this flowstone (Kuman and Clarke 2000; Ogola 2009). The two breccias identified within the Lincoln Cave system consist of a hard calcified breccia (Lincoln Cave North) and a deposit consisting of both decalcified and hard breccia (Lincoln Cave South) divided by a fill of lime miners rubble (Reynolds et al. 2007).

The spatial distribution of the cercopithecoid postcrania in these deposits is undertaken in this study. It will add to interpretations of the modes of accumulation of the materials in the Sterkfontein Caves deposits. This will be particularly useful for deposits with more complex taphonomic histories, such as Member 4.

## 2.8. Taphonomy of the fossil cercopithecoids of the Sterkfontein Caves

Fossil primates form the majority of faunal remains within the older Sterkfontein Cave deposits and their presence thus has significant implications relevant to the modes of accumulation of the infills. The taphonomic history of fossil primates at the site is a significant factor in determining the depositional history of the site and the general fauna in the Sterkfontein vicinity. Below is an account of taphonomic studies undertaken on the fossil primates at the Sterkfontein Caves.

Member 2, one of the earliest deposits, contains faunal collections dominated by fossil remains of cercopithecids and felids. The collection is comprised of partial skeletons across all taxonomic groups that includes a full representation of skeletal elements, in addition to the presence of a complete skeleton of *Australopithecus* (Pickering *et al.* 2004a). The Member 2 deposit suggests that the infill accumulated as a result of a death trap whereby animals fell into the cave and were either killed by the fall or were unable to exit (*ibid.*). Some rare carnivore tooth damage represented by scores, pits, punctures and crenulation are present in the primate assemblage, but their paucity does not support significant carnivore involvement in the accumulation of the primate assemblage (Pickering *et al.* 2004a).

C.K. Brain (1981) initiated taphonomic studies of the Member 4 macro-vertebrate fossil assemblage. This assemblage preserves the largest collection of fossil primates at Sterkfontein

and it has been reported that 3400 fossil primate specimens have been recovered from the infill (Kuman & Clarke 2000). The results of Brain's study suggested involvement of porcupines and a possibility of carnivore accumulation of the assemblage (Brain 1981). The presence of carnivore modification marks represented by scores, pits, punctures and crenulation in Member 4 also suggests a carnivore ingested assemblage. The identity of the specific carnivores that could have accumulated the fossil primate remains could not be ascertained. Brain (1981: 213) suggested that carnivores represented in the sample--leopard, *Dinofelis*, *Megantereon*, hunting hyaenas (*Chasmoporthetes*) and spotted hyaena (*Crocuta*)--could have been the major contributors to the fossil assemblage.

Pickering *et al.* (2004b) revisited the fossil primate assemblage to explain their high frequencies in the Member 4 deposit. The authors examined the skeletal part representation and the minimum number of individuals, and they analysed the surface modifications on limb bones of all hominin specimens. Assessment of the ratio of NISP: MNE (Number of Identified Specimens: Minimum Number of Elements) indicated that carnivores other than hyaena accumulated the hominin sample (Pickering *et al.* 2004b). The NISP: MNE ratio of 1.00 to 1.04 is apparent for bone accumulations by leopards and lions, while hyaenas produce higher ratios of around 5.90 (Richardson 1980). Carnivore tooth marks with intense damage are also reported to be scant in the assemblage. The tooth mark frequency on the limb bones is also not equivalent to that inflicted by hyaenas. Pickering *et al*. (2004b) then concluded that large carnivores were responsible for the accumulation of the hominin assemblage in Member 4.

Additional research on the taphonomy of Member 4 fossil primates conducted by Kibii (2004) supported Pickering *et al.*'s research. Kibii (2004) examined the bone surface modification and assemblage formation in light of primate body size, age, locomotor habits, the presence of predators and, predator hunting range. Not all primate specimens that were recovered in the Member 4 infill were assessed for bone surface modification. Thus, Kibii (2004: 67) notes that the taphonomy of the primates in Member 4 can only be 'considered with the incorporation of all the specimens recovered from the infill'. Medium sized primate individuals have a higher representation in the Member 4 assemblage and could have thus been prey to the majority of carnivore predators in the Member 4 fossil assemblage (Kibii 2004). Moreover, a death trap scenario is also one of the modes of accumulation suggested by the presence of a full range of fossil primate skeletal elements in the infill. This research will attempt to address the concern

raised by Kibii by providing a comprehensive study of the primate fossil remains from all Sterkfontein cave deposits.

Kibii (2000) also studied the Jacovec Cavern primate assemblage and concluded it was most likely accumulated as a result of a combination of processes such as surface slope wash, carnivore action and gravitational slump. Three hundred thirteen fossil cercopithecoid specimens have been recovered from Jacovec Cavern. In terms of carnivore activity, the skeletal part representation is consistent with leopard ravaged carcasses in a refuse assemblage and 3% of fossil primate collection possesses carnivore related modification marks.

Younger deposits studied by Brain (1981) and later by Pickering (1999), such as the Member 5 deposits, demonstrate a decline in the frequency of fossil primate individuals relative to bovids. The predominance of dry-broken bone and the rarity of dense skeletal parts in the StW 53 deposit led Pickering (1999) to suggest that part of the infill represented in the excavated sample was impacted on by post-depositional processes such as sediment compaction and rock fall. The StW 53 infill preserves a low portion of chewed and digested bone (*ibid*.).

The Oldowan infill preserves a full range of cercopithecoid post-cranial elements including fragile ribs and vertebrae (Pickering 1999). Skeletal element representation in this infill suggests that the cave was a death trap at some point, and some surface wash of materials from areas surrounding the cave entrance is also indicated by abrasion of the bone remains (*ibid*.).

In the Member 5 West assemblage primates are represented by limb bones, axial skeletons and cranial pieces (Pickering 1999). Pickering (1999) suggests that the whole faunal assemblage in the Member 5 West infill accumulated as a possible result of hyaena accumulation, porcupine collection and materials washing in from the surface of the cave. Hyaena accumulation is inferred from the abundance of hyaena remains, including young hyaenas, and the absence of hominin-inflicted bone damage in the assemblage (Pickering 1999).

Lincoln Cave preserves the least number of fossil primate remains in the whole Sterkfontein Cave system. Only four fossil *Papio* individuals are preserved in the deposits (Reynolds *et al.* 2007). Reynolds' (2000) taphonomic analysis of the Lincoln Cave deposits, which preserves high percentages of carnivore damage, suggests that carnivores were active in the surface catchment area during the time of deposition.

The Member 6 fossil cercopithecoid collection consists of only two elements. The general skeletal element representation of the fauna in the deposit is poor with only compact elements represented. Ogola (2009) concluded that the Member 6 fossil faunal assemblage could be partly attributed to carnivore predation. In the Post Member 6 assemblage non-hominin fossil primate postcrania are better represented with 13 specimens (44% of the post Member 6 fossil primate NISP) compared to the Member 6 deposits. Cranio-dental remains dominate the assemblage. The taphonomic factor implied in the accumulation of some of the Post Member 6 collection is that they could have been the result of a death trap (Ogola 2009).

Taphonomic interpretations of assemblages in Member 2, Jacovec Cavern, Member 4, StW 53 infill, Oldowan Infill, Member 5 West, Member 6, Post Member 6 infills and Lincoln Cave indicate the presence of carnivore involvement to varying degrees. Only Pickering (1999) in his study of Member 5 West suggested a specific carnivore, a hyaena. However, this interpretation is based on the Member 5 West assemblage that consists of various animal taxa and in which primate remains are less represented. Most of the taphonomic interpretations using criteria such as body size and taxa, skeletal element representation and type of bone surface modification can only suggest the involvement of carnivores in general rather than a specific genus. This study supplements these aforementioned criteria with a new method of analyzing tooth pit dimensions in order to better identify the carnivores that could have accumulated the primate bone assemblages.

## 2.9. Identification of specific carnivore agents

Previous research indicates that carnivore modification is present on fossils from the Sterkfontein deposits and various criteria have been used to determine the carnivores involved. Dominguez-Rodrigo and Piqueras' (2003) model measures tooth pit marks on the limb bone specimens to determine which carnivores could have imparted those marks, and is based on tooth pit variations of modern carnivore taxa. Even though their study is based on modern taxa, it is the only model of its kind that applies data from extant carnivores to tooth pit dimensions of extinct carnivore taxa. Selvaggio (1994) makes inferences regarding tooth pit dimensions produced by extinct carnivore taxa such as *Dinofelis*, *Homotherium* and *Megantereon*. The difference between Selvaggio (1994) and Dominguez-Rodrigo and Piqueras' (2003) models is

that Selvaggio used pit length and breadth ratios which yielded many overlaps on the measurements, while the latter analysed these variables separately, which provided clearer distinction between taxa. It is for this reason that Dominguez-Rodrigo and Piqueras' (2003) model is preferred.

Pits are 'bone surface modifications imparted by animal chewing and appear as discrete, roughly circular marks in plan view, resulting from scarring bone without inward crushing of bone cortex' (Pickering & Wallis 1997: 1120). These authors provide detailed measurements of pits produced by:

- spotted hyaena,
- jackal,
- dog,
- lion,
- leopard, and
- cheetah.

Epiphyses and diaphyses are treated separately, as carnivore teeth impact differently on spongy bone (epiphyses) and dense bone (diaphyses), and data on them is recorded as such:

Table 2.4. Carnivore tooth pit size distribution on epiphyses

| Length | Breadth |
|---|---|
| 1. <4mm: small canids. | <2mm: medium sized felids. |
| 2. 4-6mm: middle sized carnivores except felids. | 2-4mm: most carnivores. |
| 3. >6mm: large sized carnivores and felids. | >4mm: hyaenas and lions. |

Table 2.5. Carnivore tooth pit size distribution on diaphyses

| Length | Breadth |
|---|---|
| 1. <2mm: small carnivores to medium felids | 1.5mm: small carnivores |
| >4mm: hyaenas dogs or lions | >2mm: hyaenas, dogs or lions |

When the whole sample of tooth pits from epiphyses and diaphyses and their ranges of variation are established, a good basis for identification of carnivore taxa using tooth mark sizes will be achieved (Dominguez-Rodrigo & Piqueras 2003). This method was applied by Pickering *et al.*

(2004c) on carnivore tooth pits in the Swartkrans Member 3 fossil assemblage. Their results led them to note that there are taxon-specific carnivore tooth marks. Dominguez-Rodrigo and Piqueras (2003) further suggest that tooth pit size should be complimented by other methods, such as analysis of skeletal element frequencies and taphonomic analysis to provide a comprehensive analysis of observed results.

Generally found on cancellous bone, furrows, or what other authors (e.g. Binford, 1981; Brain 1981) refer to as scooping or hollowing out, occur as a result of removal of soft tissue (Bonnichsen 1973; Maguire *et al.* 1980). Bone furrowing patterns are characteristic of individual carnivores (Dominguez-Rodrigo & Piqueras 2003). Intense bone furrowing of epiphyses is likely to be produced by hyaenids, leopards and canids (*ibid.*). Proximal and distal parts of upper limbs particularly suffer furrowing from lion teeth (Haynes 1983). Non-intensive furrows are generally associated with lions (Dominguez-Rodrigo & Piqueras 2003).

# CHAPTER THREE

# MATERIALS AND METHODS

## 3.1 Materials

Materials utilised in this research are the Plio-Pleistocene cercopithecoid postcrania collections from Sterkfontein Caves of South Africa. The assemblage consists of materials collected from the lime miners' dumps and those from *in situ* material processed from ongoing excavations at the site (see Appendix A for a catalogue of the fossil cercopithecoid postcrania assemblage from Sterkfontein according to their respective infills). These materials include fossil Cercopithecoidea postcrania housed at Sterkfontein, the Ditsong Museum of Natural History in Pretoria (formerly known as the Transvaal Museum), and, during this study, at the primate laboratory of the School of Anatomical Sciences at the University of the Witwatersrand. Kuman & Clarke (2000) report that more than 3400 fossil primate (hominid and non-hominid) skeletal remains have been uncovered from Sterkfontein Member 4 only. They include both fossil cranio-dental and postcranial specimens. Fossil cercopithecoidea postcrania from Sterkfontein, including those from Member 2, Jacovec Cavern, Member 4, StW 53 Infill, Oldowan infill, Member 5 West, Member 6, Post Member 6 and Lincoln Cave deposits, are analysed. The sum of identifiable fossil non-hominid primate postcranial materials examined in this study is 1514.

### *3.1.1. Excavated materials*

Excavated materials used in this study were first obtained by Robert Broom between 1936 and 1945. Excavations were continued by Broom and John Robinson between 1945 and 1949 and, by Robinson and Revil Mason in the 1950s. Alun Hughes excavated large numbers of primate fossils between 1966 and 1991, the year when he retired. He was succeeded by Ronald Clarke and excavations have continued until the present.

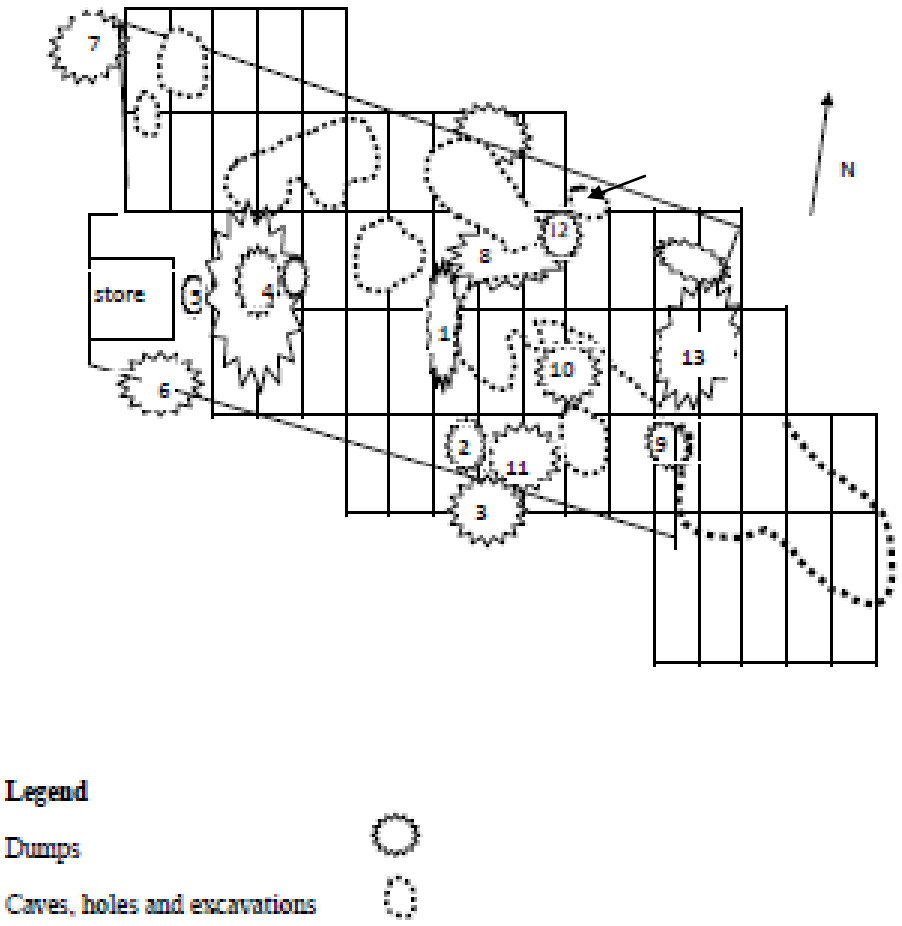


Figure 3.1. Plan of Sterkfontein site demonstrating the locality of the dumps in relation to the excavation sites (adapted from Hughes and Tobias 1969). Dump 18 is underground and is indicated with an arrow.

### 3.1.2. *Materials derived from the dumps*

After the opening of systematic excavations by Hughes and Tobias in 1966 at Sterkfontein Caves, one of their first tasks was to process rubble dumps left at various localities by the lime miners who were extracting the stalagmites and stalactites from the caves. Hughes and Tobias (1969) numbered these dumps and then labeled them on a site plan (Figure 3.1). The fossils in the dumps derive from areas quarried by the lime-miners.

The miners did not move the quarried materials far from the area they were working; therefore it was possible to relate dump material from Dumps 10, 12, 13, 14, 15, 17 and 18 to the various infills of the cave system (Heaton 2006). These materials were stored at four locations: on site at the Sterkfontein Caves, at the School of Anatomical Sciences and the Bernard Price Institute at the University of the Witwatersrand (the latter two now moved to the Evolutionary Studies Institute), and the Ditsong Museum of Natural History (formerly known as the Transvaal Museum). Large quantities of primates and other fossils came from the breccia that was labeled Member 4 of the Sterkfontein Formation by Partridge (1978). Dump 20 is not shown in Figure 3.1 as it was located underground in the Silberberg Grotto and contained primates from Members 2 and 3 (*ibid*.).

### 3.1.3. *The condition of the collection*

The Sterkfontein fossil faunal sample consists of highly fragmented materials mainly due to rock fall caused by collapse and other pressures within the deposits. The samples from lime miners' dumps are also generally highly fragmented, largely due to being blasted out of their original context. As a result the Sterkfontein fossil primate assemblage is dominated by incomplete elements; complete bones are a rare occurrence in the sample. The provenance of the specimens is noted and the impact on the taphonomic history of the sample is addressed in Chapter 5. The fragmented nature of the Sterkfontein materials reduced the diagnostic sample size of the assemblage and impacted on taxonomic assignment of the specimens. This is discussed in Chapter Five of the thesis.

### 3.1.4. *Comparative materials*

Modern comparative samples from the School of Anatomical Sciences in the Raymond Dart Collection (RDC) and the Evolutionary Studies Institute (ESI) at the University of the Witwatersrand, the Vertebrate Palaeontology department of the Ditsong Museum of Natural History (DMNH) and the Primate Morphometrics Online (PRIMO) Database of the New York Consortium in Evolutionary Primatology (NYCEP) are used in this study. A complete list of the modern comparative skeletal remains is attached in Table 3.1 and

Table 3.2. Various literature on taxonomic descriptions of cercopithecoid post-crania from East African and southern African sites also forms the basis for consultation on taxonomic identification of the fossil cercopithecoid postcrania from Sterkfontein (e.g. Harrison 1989; Delson *et al.* 1993; Leakey 1993; Jablonski & Chaplin 2008). Frost & Delson (2002) provide detailed descriptions and measurements of cranial and postcranial morphology of *Parapapio, Papio*, *Cercopithecoides* and *Theropithecus*, which are genera previously identified in the South African fossil cercopithecoid cranial specimens. Jablonski, Leakey and Anton (2008) provide a detailed qualitative descriptive analysis of Cercopithecoidea from the Koobi Fora region in Kenya, which the author assessed at the Nairobi Museum in Kenya. Eisenhart (1957, 1960, 1961), Freedman (1974) and Heaton (2006) have also provided descriptions of crania and dentition from Sterkfontein, Makapansgat and Taung.

**Table 3.1. A list of comparative materials utilised in this study**

| Number | Location | Catalogue no | Elements | Taxon |
|---|---|---|---|---|
| 1. | ESI | BP1/C 295 | Humerus, Radius, Ulna, Femur, Tibia | *Cercopithecus aethiops* |
| 2. | RDC | V33 | Humerus, Radius, Ulna, Femur, Tibia | *Cercopithecus aethiops* |
| 3. | RDC | Za 12S | Humerus, Tibia | *Cercopithecus aethiops* |
| 4. | RDC | Za 862 | Humerus, Radius, Ulna, Femur, Tibia | *Cercopithecus aethiops* |
| 5. | RDC | Za 864 | Humerus, Radius, Ulna, Femur, Tibia | *Cercopithecus aethiops* |
| 6. | RDC | Za 973 | Ulna, Radius, Tibia | *Cercopithecus aethiops* |
| 7. | RDC | Za 968 | Humerus, Radius, Ulna, Femur, Tibia | *Cercopithecus aethiops* |
| 8. | RDC | Za 1129 | Humerus, Femur | *Cercopithecus aethiops* |
| 9. | RDC | Za 1244 | Humerus, Radius, Ulna, Femur, Tibia | *Cercopithecus aethiops* |
| 10. | RDC | Za 1226 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 11. | RDC | Za 1357 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 12. | RDC | Za 11232 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 13. | RDC | Za 1299 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 14. | RDC | Za 1360 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 15. | RDC | Za 740 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 16. | RDC | Za 1231 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 17. | ESI | BP1/C 541 | Humerus, Radius, Ulna, Femur, Tibia | *Papio ursinus* |
| 18. | RDC | Za 1226 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 19. | RDC | Za 1227 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 20. | RDC | Za 1228 | Humerus, Radius, Ulna, Femur, Tibia | *Papio sp* |
| 21. | DMNH | Az/981 | Humerus, Radius, Ulna, Femur, Tibia | *Colobus guezara* |
| 22. | DMNH | Az/807 | Humerus, Radius, Ulna, Femur, Tibia | *Colobus guezara* |

| | | | | |
|---|---|---|---|---|
| 23. | DMNH | Az/155 | Humerus, Radius, Ulna, Femur, Tibia | *Colobus guezara* |
| 24. | DMNH | Az/1437 | Humerus, Radius, Ulna, Femur, Tibia | *Colobus guezara* |
| 25. | DMNH | Az/971 | Radius, Ulna, Femur | *Mandrillus sphinx* |
| 26. | DMNH | Az/972 | Humerus, Radius, Ulna, Femur, Tibia | *Mandrillus sphinx* |

Table 3.2. Comparative sample utilised for the quantitative analysis derived from the PRIMO NYCEP database.

| **Genus** | **N** |
|---|---|
| *Colobus* | 29 |
| *Procolobus* | 10 |
| *Paracolobus* | 3 |
| *Rhinocolobus* | 2 |
| *Cercopithecoides* | 3 |
| *Chlorocebus* | 3 |
| *Cercopithecus* | 56 |
| *Papio* | 57 |
| *Mandrillus* | 13 |
| *Theropithecus* | 29 |

Table 3.3. Comparative materials from the literature

| | Reference | Specimen no | Elements | Taxon |
|---|---|---|---|---|
| 1. | Frost & Delson, 2002 | AL 363-12 | Humerus | cf. *Parapapio jonesi* |
| 2. | Jablonski *et al*, 2008 | KNMER 861 | Humerus | cf. *Parapapio*, |
| 3. | Jablonski *et al*, 2008 | KNM-ER 30315 | Ulna | cf. *Parapapio*, |
| 4. | Jablonski *et al*, 2008 | KNMER 30298 | Humerus | *Parapapio* sp. indet |
| 5. | Jablonski et al 2008 | KNMER 3013 | Humerus, Ulna, Femur | *Theropithecus brumpti* |
| 6. | Jablonski *et al*, 2008 | KNMER 18197 | Humerus, Ulna, Radius | *Theropithecus oswaldi* |
| 7. | Jablonski *et al*, 2008 | KNMER 5491 | Humerus, Ulna | *Theropithecus oswaldi* |
| 8. | Elton *et al*, 2003 | Zambian specimen | Femur | *Theropithecus* cf. *darti* |
| 9. | Jablonski *et al*, 2008 | KNMER 974 | Femur | *Cecopithecoides* cf. *williams* |
| 10. | Jablonski *et al*, 2008 | KNMER 4420 | Femur | *Cercopithecoides williamsi* |
| 11. | Jablonski *et al*, 2008 | KNMER 44361 | Humerus | *Cercopithecus* sp. indet |

## 3.2 Methods

Excavations at the Sterkfontein site in the mid 1950's and from 1966 onwards were undertaken systematically. The provenance of excavated fossils was recorded in feet (') and inches (") of depth below datum and in 3 foot x 3 foot (90cm x 90cm) grid squares given successive letters from north to south and consecutive numbers from east to west. See Figure 3.1 for grid square numbers.

Data on the specimens are recorded as:

- specimen number,
- skeletal element,
- element portion,
- side,
- taxon,
- size class, and
- the maturation age of the individual.

As applied in most research on taphonomy, the following is also recorded: weathering stage, with reference to Behrensmeyer's work (1978), and bone surface modifications of all the fossil primate bone specimens (Binford 1981; Blumenschine & Selvaggio 1988, 1991; Shipman 1981; Pickering 1999). In order to measure skeletal element and individual abundance the following were calculated: the number of identified specimens (NISP), the minimum number of elements (MNE), and the cumulative number of individuals (cMNI) (Grayson 1989; Bunn 1982, 1986; Klein & Cruz-Uribe 1984; Bunn & Kroll 1986; Pickering 1999).

Size classes were allocated according to the following classification.

- Small: <11 Kg (smaller than modern adult *Papio ursinus*)
- Medium: 11-29Kg (Comparable in size to a modern adult *Papio ursinus*)

- Large: ≥30Kg (Primates equal to or larger in size than a modern adult *Papio ursinus*)

Two approaches are adopted to analyse the Sterkfontein cercopithecoid limb elements. Qualitative and quantitative analyses are undertaken on the humeri, radii, ulnae and femora which dominate the fossil cercopithecoid postcrania assemblage.

### 3. 2.1. Determining taxa of the Sterkfontein Caves fossil cercopithecoid postcranial remains

Qualitative and quantitative approaches are applied to the Sterkfontein Cave fossil cercopithecoid postcrania to determine their taxonomic affiliations. These two methods are combined to determine the behaviours of the Sterkfontein fossil cercopithecoids. In addition to the qualitative data, statistical analyses are applied to determine the variables which discriminate between genus and, where possible, species level.

a) *Qualitative analysis*

The qualitative taxonomic study undertaken in this thesis is adapted from this comprehensive examination. Additional data for qualitative analysis is adapted from literature sources which provide different measures for variation on postcranial skeletal elements (e.g. Szalay & Delson 1979; Harrison 1989; Leakey 1993; Frost & Delson 2002; Thackeray & Myer 2004). Qualitative data focus on unique landmarks and anatomical traits which are aligned to functional morphology. To establish variation, a suite of 36 anatomical landmarks from the humerus, ulna, radius and femur were qualitatively analysed from specimens which preserve determinant landmarks. These are adapted Harrison 1989; Leakey 1993; Frost & Delson 2002 and Jablonski, Leakey & Anton 2008. Their variation in the form of shape, position and size relative are described. A comprehensive list of these is attached as Appendix B. Three important regions for locomotion and postural behaviors are considered in this study:

- The upper fore-arm

  The upper humerus:

  Variation of the humeral greater and lesser tuberosity, which are attachment sites for the rotator cuff muscles of the shoulder, are associated with variation in locomotor habits (Krentz 1993). According to Krentz (1993), disparity in their morphology mirrors the importance towards stability of the shoulder joint. The shape of the humeral head and greater tuberosity, the size of the greater tuberosity relative to the humeral head structurally define the movement of the shoulder joint (Harrison 1993). Therefore the upper humerus is an essential component for understanding locomotor preferences which are associated with different taxa. Table 3.4. provides a list of morphological traits assessed on proximal humeral specimens,

  Table 3.4. Qualitative analysis of the proximal humerus

| | |
|---|---|
| 1. | Head shape |
| 2. | Head shape and lesser tuberosity separated by a groove |
| 3. | Superior extension of greater tuberosity relative to the humeral head |
| 4. | Greater tuberosity lateral surface area shape |
| 5. | Size of greater tuberosity relative to lesser tuberosity |

- The lower fore-arm (Figure 3.5)

  The distal humerus is one of the most occurring fossil remains in the Sterkfontein cercopithecoid assemblage. This anatomical part is important in distinguishing between arboreal and terrestrially adapted locomotion (Krentz 1993). Variation in morphology of the distal humerus reflects differing requirements for stability, forearm movement and digit dexterity (*ibid.*). The medial epicondyle and its varying degrees of orientation, the distal shaft walls, the olecranon fossa, height of olecranon process and the shape of radial head provide useful information as indicators of locomotor type. Harrison's (1989) analysis of *Victoriapithecus* remains from Maboko Island, Kenya has demonstrated a wide range of

morphological indices which can be applied to determine taxa and he concludes that the distal humerus provides the best evidence to determine taxa at the site.

Table 3.5. Qualitative analysis of the lower humerus

| | |
|---|---|
| 6. | Distal shaft thickness |
| 7. | Distal shaft symmetry |
| 8. | Distal shaft dorsal pillar shape above medial and lateral epicondyle |
| 9. | Medial epicondyle orientation |
| 10. | Size of medial epicondyle relative to lateral epicondyle |
| 11. | Lateral epicondyle morphology |
| 12. | Olecranon fossa shape |
| 13. | Length of medial lip distal projection |
| 14. | Capitulum shape |

The proximal ulna (Table 3.6) and radius (Table 3.7)

The height of the olecranon process is different between colobines and terrestrial cercopithecines and quadrupedal arboreal and semi-terrestrial cercopithecines (Harrison 1993). Not much variation exist in the proximal radius, the main difference can be observed on the length of the neck which can discriminate between colobines and semi-terrestrial and terrestrial monkeys (*ibid*.)

Table 3.6. Qualitative analysis of the Ulna

| | |
|---|---|
| 15. | Olecranon superior aspect morphology |
| 16. | Olecranon orientation |
| 17. | Olecranon superior projection relative to trochlea notch |
| 18. | Anconeal process articular surface |
| 19. | Olecranon lateral aspect relative to medial aspect |
| 20. | Sigmoid notch shape |
| 21. | Coronoid process articular surface |
| 22. | Ulna shaft groove distal to coronoid process |
| 23. | Shaft shape |

Table 3.7. Qualitative analysis of the radius

| | |
|---|---|
| 24. | Head shape |
| 25. | Head orientation |
| 26. | Bicipital tuberosity surface |
| 27. | Shaft shape |

- The hind-limb

  The hip joint (Figure 3.8)

  The proximal femur morphology holds specializations for the hip joint which are indicative of hip abduction and rotation capabilities (Nakatsukasa 1994). Distal to the hip joint, i.e. the distal femur and tibia, there is less variation in morphology within cercopithecoids. As a result, the distal tibia is not included in this study.

Table 3.8. Qualitative analysis of the femur

| | |
|---|---|
| 28. | Head shape |
| 29. | Extension of greater trochanter relative to the head |
| 30. | Greater trochanter lateral surface area |
| 31. | Position and shape of fovea capitus |
| 32. | Neck size |
| 33. | Depth of intertrochanteric fossa |
| 34. | Lesser trochanter shape and orientation |
| 35. | Shaft shape |
| 36. | Size of medial condyle relative to lateral condyle |

b). *Quantitative and Statistical analysis*

Standard digital caliper measurements are recorded for quantitative analysis on specimens with diagnostic anatomical landmarks. Measurements are taken on anatomical landmarks on the basis of their functional significance and their potential to distinguish size variation. The quantitative study provides a morphometric analysis of the anatomical

landmarks and measurements, and these are compared to established means and ranges of skeletal elements of identified taxa. Collectively, 35 measurements deriving from the humerus, ulna, radius and femur are recorded which are compared against existing comparative materials and literature. Detailed results of these are attached in Appendix B. To avoid bias of taxonomic alignment of postcrania based on the available cranio-dental data in an infill, descriptions of fossil specimens are initially undertaken without reference to their chronological or spatial origin within the Sterkfontein Cave site.

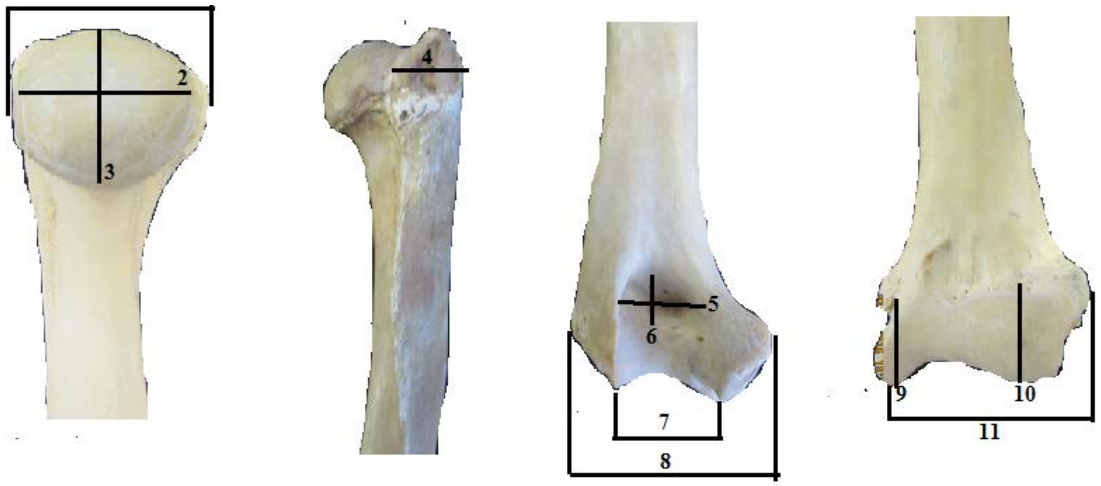


Figure 3.2. Illustration of measurements derived from the humerus

Table 3.9. Measurements derived from the humerus

| NUMBER | ACRONYM | REGION |
|---|---|---|
| **1** | **PMLD** | Proximal medio-lateral dimension |
| **2** | **HHD** | Humeral head diameter |
| **3** | **APLHH** | Anterior- posterior length of humeral head |
| **4** | **GTD** | Greater tuberosity diameter |
| **5** | **MMLLO** | Maximum medio-lateral length of olecranon fossa |
| **6** | **MPDLO** | Maximum proximo-distal length of olecranon fossa |
| **7** | **DAB** | Distal articular breath |
| **8** | **BEB** | Bi-epicondylar breadth |
| **9** | **MTFL** | Medial trochlea flange length |
| **10** | **PDHC** | Proximo-distal height of capitulum |
| **11** | **LEMET** | Lateral epicondyle to medial edge of trochlea |
| **12** | **AME** | Angle of medial epicondyle relative to axis of distal articular surface |

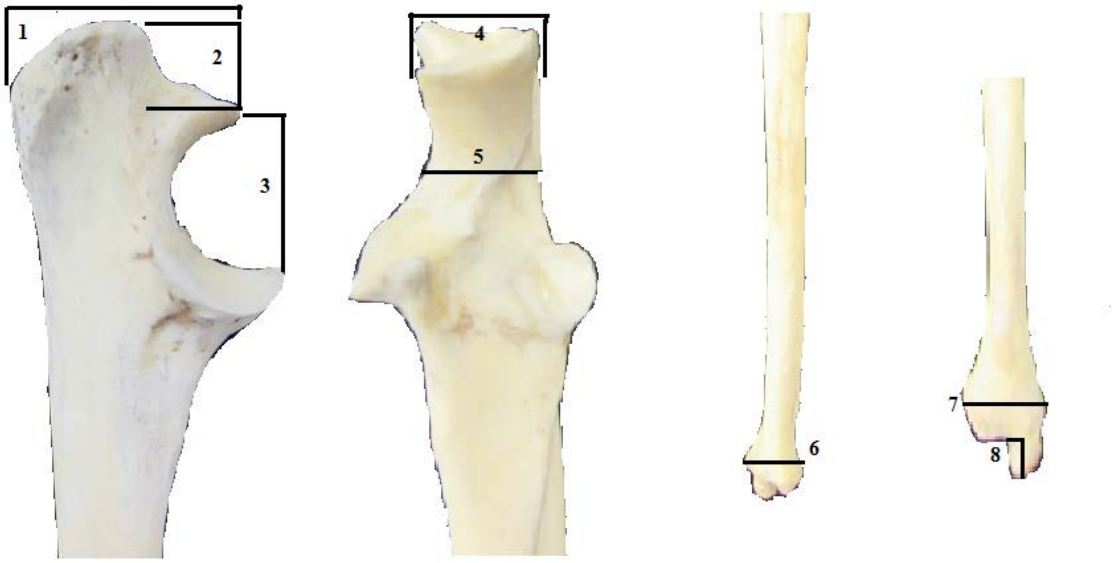


Figure 3.3. Illustration of measurements derived from the ulna

Table 3.10. List of measurements derived from the ulna

| NUMBER | ACRONYM | REGION |
|---|---|---|
| **1** | **APLOP** | Anterior-posterior length of olecranon process |
| **2** | **PDHOP** | Proximo distal height of olecranon process |
| **3** | **PDLTN** | Proximo-distal length of trochlear notch |
| **4** | **MLBOP** | Medio-lateral breadth of olecranon process |
| **5** | **MLBTN** | Medio-lateral breadth of trochlea notch |
| **6** | **DAPW** | Distal antero-posterior width |
| **7** | **DMLB** | Distal medio-lateral breadth |
| **8** | **LUS** | Length of ulna styloid |

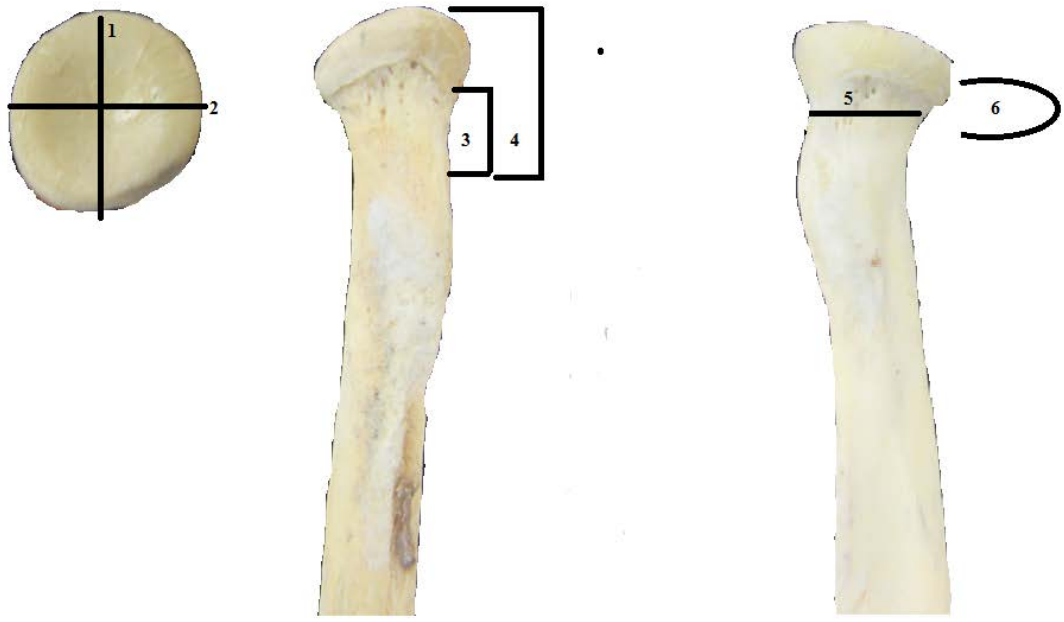


Figure 3.4. Illustration of the measurements derived from the radius

Table 3.11. Radius

| NUMBER | ACRONYM | REGION |
|---|---|---|
| **1** | **MDRH** | Maximum diameter of radial head |
| **2** | **PBRH** | Perpendicular breadth of radial head |
| **3** | **PDHRN** | Proximo distal height of radial neck |
| **4** | **PDHRNH** | Proximo-distal height of radial neck and head |
| **5** | **MLBRN** | Medio-lateral breadth of radial neck |
| **6** | **APWRN** | Anterior-posterior width of radial neck |

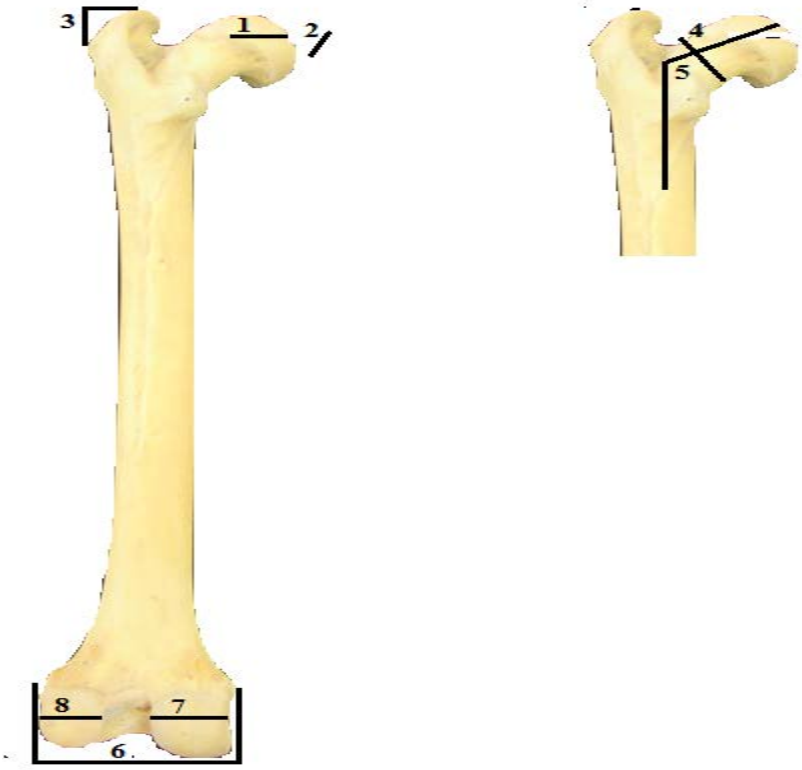


Figure 3.5. Illustration of measurements derived from the femur.

Table 3.12. Measurements derived from the femur

| NUMBER | ACRONYM | REGION |
|---|---|---|
| **1** | **MLBFH** | Medio-lateral breadth of femur head |
| **2** | **APHD** | Anterior-posterior head diameter |
| **3** | **GTP** | Greater trochanter projection |
| **4** | **ND** | Neck diameter |
| **5** | **NSA** | Neck-shaft angle |
| **6** | **BB** | Bi-condylar breadth |
| **7** | **MCW** | Medial condyle width |
| **8** | **LCW** | Lateral condyle width |
| **9** | **PSRH** | Patella surface rim height |

The Sterkfontein assemblage is highly fragmented. Within the whole Sterkfontein fossil cercopithecoid limb sub-assemblage, only one element is complete and no other

specimen preserves a full suite of characters. However, statistical methods are applied to skeletal elements to estimate taxonomic affinities. Linear measurements are run through a bivariate linear regression analysis to assess the relationship between variables and the significance of the association. Univariate Analysis of Variance (ANOVA) is applied to reveal the traits which are significantly different among taxonomic groups. To determine if groups are statistically significant Discriminant Function Analysis (DFA) is applied. These are undertaken using the Paleontological Statistics Programme (PAST) Version 3.6 (Hammer *et al.* 2001).

### 3.3. Establishing diagnostic morphology from the modern skeleton: qualitative analysis

Diagnostic morphology for determining features which distinguish between taxa of the comparative specimens is established through qualitative and quantitative and statistical analysis. Postcranial elements of three genera (*Papio*, *Cercopithecus* and *Colobus*) are analysed for qualitative traits.

a. Subfamily Cercopithecinae Gray 1921
Tribe Papionini Burnett 1828
Subtribe Papionina Burnett 1828
Genus *Papio* Eerxleben, 1777

Figure 3.6. Modern *Papio ursinus* (BPI/C/541) skeletal elements a) humerus; b) ulna; c) radius; and d) femur.

a) The humerus

The head is proximo-distally compressed. The head and the lesser trochanter are continuous. The greater trochanter is significantly larger than the lesser trochanter and its superior extension lies above the level of humeral head. Its lateral surface area is slightly convex. The shoulder mobility is restricted in this genus. The tuberosities vary in size with the greater tuberosity being significantly larger than the lesser tuberosity. The shaft is approximately straight. Distally, the shaft morphology is asymmetrical, thick and rounded in the coronal plane. The medial epicondyle is retroflexed and approximately equal in size to the lateral epicondyle. The lateral epicondyle has a small dorsal face and projects slightly above the level of the olecranon fossa. The trochlea breadth is narrow. Its medial lip distal projection is short. It is also medially inclined relative to shaft. The capitulum is rounded and its medio-lateral width is even in the proximo-distal axis. The olecranon fossa is shallow and has an elongated-ellipsoid shape.

b) The ulna

The anconeal process is in horizontal plane with no significant proximal extension. The coronoid process is also in horizontal plane with no significant distal extension. The trochlea notch is crescentic. The olecranon is less than the trochlea notch length. The centre of the olecranon process is retroflexed. In medial view, the anconeal process is sharply projecting dorsally; it is flattened in the antero-posterior dimension. In medial view, the posterior portion of the olecranon process rises sharply. The shaft is approximately straight. The styloid process is a rounded globular projection with a rounded facet laterally.

c) The radius

In superior view, the radius head is ovoid and slightly depressed. Its medial and lateral borders are slightly unequal in height. The bicipital tuberosity is bulbous and elongated proximo-distally. In lateral view, it extends out of the shaft and has a longitudinal groove laterally. The bicipital tuberosity is mainly rugose, and it protrudes laterally. The neck is

also relatively short. The radial shaft in *Papio* is superiorly dorso-ventrally flattened and approximately straight. The styloid process is a sharp distally oriented projection.

d) The femur

The head has a superior orientation. The fovea capitis is located centrally on the anterior head surface. The femoral head bears obvious dorsal extension towards the greater trochanter. The greater trochanter has a blunt apex and has a slight medial orientation. On anterior view, the proximal neck is a medially tilted u-shaped slope. The intertrochanteric fossa shape is large and deeply cavitated. It is located at the same level as the femoral head and is narrow with parallel margins. The lesser trochanter is long with a parabolic profile and faces more medially than dorsally. The neck is short. The shaft is nearly straight. Distally, the lateral condyle is smaller than the lateral condyle. They are splayed with a deep inter-condylar fossa.

b. Subfamily Cercopithecinae Gray, 1821

Tribe Cercopithecini Gray, 1821

Genus *Cercopithecus* Brunnich, 1772


Figure 3.7. Modern *Cercopithecus aethiops* (BPI/C/295) skeletal elements a) humerus; b) radius; c) ulna; and d) femur.

a) The humerus

The humerus head is hemi-spherical. The greater tuberosity lies at the same level as the head. The greater tuberosity is larger than the lesser tuberosity. The shaft has a lateral

bow. Distally, the humerus shaft is symmetrical. It has a shallow, high and rounded olecranon fossa. In specimen Za 973 the olecranon fossa has a centrally located fenestra. The medial epicondyle is retroflexed. The trochlea medial lip distal projection is very short and projects medially. The dorsal pillars are wider and thicker above the lateral epicondyle. The capitulum is relatively flatter than in *Papio*. The medial epicondyle is larger than the lateral epicondyle.

b) The ulna

The shaft is approximately straight. In medial view the olecranon is slightly concave. The olecranon superior projection is almost equal to the trochlea notch height. The radial notch is a rounded facet which lies against the disto-medial trochlea notch. Distal to the radial notch the supinator crest and the ulna tuberosity are form defined ridges.

c) The radius

The head shape is ovoid. It bears a deep rounded depression for accommodation of the capitulum. The lateral aspect is higher than the medial aspect. The bicipital tuberosity is half circular with a nodule on its distal corner. The neck is long compared to *Papio*. The neck and the shaft are medio-laterally flattened. The shaft has a slight lateral bow.

d) The femur

The head is superiorly oriented. The greater trochanter has a blunt apex and is superiorly oriented. The lesser trochanter is dorsally oriented. The superior neck extension is reduced towards the head; it has more surface area distally than superiorly. The intertrochanteric groove is deep and elongated proximo-distally. The greater trochanter lateral surface area is rugose. Distally the lateral condyle is narrower than the medial condyle.

*Cercopithecus aethiop*s is used to identify specimens of modern taxa which are provenanced as such in their catalogues from University of the Witwaterand. For ease of reference and consistency with their cataloguing, the species *Cercopithecus aethiops* is retained.

is

c. Subfamily Colobinae Jerdon, 1867

Tribe Colobini Blyth, 1875

Genus *Colobus* Illiger, 1811

Species *Colobus guezara*

Figure 3.8. Modern *Colobus guezara* specimens, a) humerus, b) ulna, c) radius, d) femur, and e) tibia.

a) The humerus

The humeral head is rounded on anterior view. The greater and lesser tuberosities are almost equal in size. The greater tuberosity superior extension lies below the level of the head. Lesser tuberosity and head are continuous. Unlike in the cercopithecines, the

proximal humeral shaft in *Colobus*, the delto-triceps-brachialis and the deltoid crest are very pronounced. The bicipital tuberosity is shallow. Its medial and lateral edges are not defined. The shaft has a slight posterior curvature. The medial epicondyle is retroflexed. The olecranon fossa is deep and oval in shape. Distally, the shape is symmetrical in dorso-ventral view. The medial epicondyle has an extreme medial protuberance. The capitulum is bulbous and prominent. The trochlea distal projection is very short.

b) The ulna

The olecranon process is long and does not bear the same retroflexion seen in the papionins; it is straight. The olecranon bears a superiorly inclined medial flange which is another feature not seen in the papionins. On medial aspect, the olecranon superior portion is deeply cavitated creating a medial flange posteriorly. The trochlea notch proximo-distal height is almost the same as the proximal extension of the olecranon notch. The radial notch has an inverted triangle shape. The shaft has a slight lateral bow. The ulna styloid is blunt.

c) The radius

The head is oval with an extreme anterior-posterior compression unlike what is seen in the Cercopithecines. The head superior aspect has a deep depression. The radial neck is dorso-ventrally flattened. The bicipital tuberosity is a square-like eminence. The shaft is laterally bowed.

d) The femur

The femur head is supero-inferiorly compressed. The greater trochanter projects above the level of the head and is almost medially inclined. The lesser trochanter is small and medially inclined. It has a parabolic profile. The intertrochanteric groove is a small rounded fossa which lies at the same level of the head. The neck is very short and stout. The femur shaft resembles that of papionins; it is straight and symmetrical in the dorso-ventral plane. The condyles are splayed and are almost equal in size.

d. Subfamily Cercopithecinae Gray 1921

Tribe Papionini Burnett 1828

Subtribe Papionina Burnett 1828

Genus*:* *Madrillus* Ritgen 1824

Species *Mandrillus sphinx*

Figure 3.9. Modern *Mandrillus sphinx* specimens, a) humerus, b) radius, c) ulna, d) tibia and e)femur.

a) The humerus

The humerus looks very similar to *Colobus*. The head shape is rounded on anterior view. On the proximal shaft, the delto-triceps-brachialis and the deltoid crest are distinct, however not as marked as seen in *Colobus*. The greater tuberosity is almost at the same level as the head. It is almost equal in size to the lesser tuberosity. Distally, the shaft is asymmetrical (as seen in cercopithecines). The distal lateral wall is wider and thicker

above the lateral epicondyle. The olecranon is deep with a triangular shape. The medial epicondyle is retroflexed. The trochlea distal lip is long. The capitulum is rounded, however it is modestly protuberant compared to Colobus.

b) The ulna

The ulna resembles papionin ulnae. The olecranon is short and has anterior retroflexion. On anterior view, the anconeal process forms a pronounced beak, with the lateral aspect more elevated compared to the medial aspect. The radial notch is medio-laterally elongated, it forms an oval shape. The trochlea notch has a crescentic outline in the supero-inferior axis. The ulna tuberosity and the supinator crest form defined ridges creating a depression distal to the radial notch. The ulna shaft is approximately straight. Distally, the styloid process is blunt.

c) The radius

The bicipital tuberosity bears a slit-like furrow in its centre. Unlike *Colobus*, the head is thicker in the proximo-distal axis. Similar to colobines, the superior aspect of the radial head bears a deep indentation for accommodation of the capitulum. The neck is thicker than *Colobus* and oval in cross section. The shaft has a lateral bow. The radial styloid process is blunt.

d) The femur

The intertrochanteric groove on the *Madrillus* lies at the same level as the head. The lesser trochanter is flanked by a shallow depression on its supero-lateral aspect. The lesser trochanter is medially facing with a rough surface. It does not possess the groove seen in papionins. The neck is very short. The greater trochanter is elevated above the head; however it is short and faces supero-medially. The greater trochanter surface area is almost flat with a rough surface. The shaft is nearly straight as seen in other cercopithecines. The distal condyles are not as splayed as seen in *Colobus*. On anterior view, the lateral condyle is narrower than the medial condyle.

### 3.4. Establishing diagnostic morphology: quantitative analysis:

Three approaches are undertaken for the quantitative analysis. The first involves descriptive statistics of the comparative sample to illustrate variation present in the sample. Only the proximal epiphyseal joints of the ulna, the radius and the femur are subjected to statistical analysis. Descriptive statistics provide Bivariate regression analysis demonstrates correlations between variables. Multivariate Analysis of Variance (ANOVA) is applied to the measurement set to determine where the differences lie between the taxa. Bivariate regression analysis suggests strong linear correlation among morphological traits of the humerus, the ulna and the femur. Results of the Analysis of Variance (ANOVA) point to limited statistical significance. Only traits on the proximal radius and the proximal femur demonstrate differences among taxa.

Table 3.13. Descriptive statistics of the humerus proximal medio-lateral breadth (PMLB)

| **Taxa** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 25 | 34 | 39 | 2.8643 | 9.87 |
| *Cercopithecus aethiops* | 9 | 15 | 18.3 | 17.14 | 1.2164 | 7.9 |
| *Colobus guezara* | 4 | 20 | 26 | 23.675 | 2.6094 | 11.02 |
| *Mandrillus sphinx* | 1 | 26 | 26 | 26 | | |

Table 3.14. Descriptive statistics of the humeral head diameter (HHD)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 12.69 | 26 | 21.539 | 3.8419 | 17.83 |
| *Cercopithecus aethiops* | 10 | 10.91 | 14.9 | 13.946 | 4.4058 | 31.359 |
| *Colobus guezara* | 4 | 15.5 | 19.9 | 18.3 | 2.0607 | 11.2608 |
| *Mandrillus sphinx* | 1 | 21 | 21 | 21 | | |

Table 3.15. Descriptive statistics of the humerus anterior posterior length of humeral head (APLHH)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio* | 10 | 23.2 | 28.31 | 25.252 | 2.5001 | 9.900 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Cercopithecus aethiops* | 7 | 13.36 | 15.5 | 14.7386 | 0.67 | 4.545 |
| *Colobus guezara* | 4 | 17.21 | 20.1 | 19.05 | 1.8267 | 9.588 |
| *Mandrillus sphinx* | 1 | 22.6 | 22.6 | | | |

Table 3.16. Descriptive statistics of the humerus greater tuberosity diameter (GTD)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio* | 10 | 15 | 19.8 | 17.202 | 2.3422 | 13.6157 |
| *Cercopithecus aethiops* | 9 | 9 | 12 | 10.7156 | 1.268 | 11.832 |
| *Colobus guezara* | 4 | 12.9 | 16.4 | 14.4 | 1.6912 | 11.744 |
| *Mandrillus sphinx* | 1 | 13 | 13 | | | |

Table 3.17. Descriptive statistics of the humerus bi-epicondylar breadth (BEB)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio* | 10 | 31 | 44 | 34.659 | 3.7652 | 10.837 |
| *Cercopithecus aethiops* | 9 | 17 | 23.1 | 20.9367 | 2.1136 | 10.0954 |
| *Colobus guezara* | 4 | 26 | 34.9 | 30.275 | 9.9246 | 12.963 |
| *Mandrillus sphinx* | 1 | 33 | 33 | | | |

Table 3.18. Descriptive statistics of the humerus medial trochlea flange length (MTFL)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 16.17 | 18.9 | 17.786 | 2.0851 | 11.723 |
| *Cercopithecus aethiops* | 9 | 8 | 12.1 | 10.45 | 1.1951 | 11.428 |
| *Colobus guezara* | 4 | 9.1 | 12.3 | 11.075 | 1.3913 | 12.562 |
| *Mandrillus sphinx* | 1 | 13.2 | 13.2 | | | |

Table 3.19. Descriptive statistics of the humerus lateral epicondyle to medial edge of trochlea (LEMET)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 28 | 34.9 | 31.31 | 2.8196 | 9.0052 |
| *Cercopithecus aethiops* | 9 | 14.7 | 19.4 | 17.5533 | 1.5181 | 8.6448 |
| *Colobus guezara* | 4 | 21 | 28 | 25.025 | 2.9556 | 11.8107 |
| *Mandrillus sphinx* | 1 | 26 | 26 | | | |

Table 3.20. Descriptive statistics of the humerus distal articular breadth (DAB)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 23.4 | 30 | 25.525 | 2.3284 | 9.12 |
| *Cercopithecus aethiops* | 9 | 11 | 16.2 | 13.4467 | 1.6191 | 12.0411 |
| *Colobus guezara* | 4 | 17.1 | 24.9 | 20.525 | 3.3521 | 15.8443 |
| *Mandrillus sphinx* | 1 | 22.6 | 22.6 | | | |

Table 3.21. Descriptive statistics of the humerus proximo-distal height of capitulum (PDHC)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 13.69 | 18 | 14.949 | 1.3462 | 9.005 |
| *Cercopithecus aethiops* | 9 | 7.38 | 18 | 9.9289 | 3.341 | 33.364 |
| *Colobus guezara* | 4 | 8 | 14.9 | 10.75 | 2.9331 | 27.285 |
| *Mandrillus sphinx* | 1 | 11 | 11 | | | |

Table 3.22. Descriptive statistics of the humerus maximum medio-lateral length of olecranon fossa (MMLLO)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 8 | 12.1 | 26.2 | 15.0589 | 4.5809 | 3.04 |
| *Cercopithecus aethiops* | 9 | 9.02 | 14.2 | 11.35 | 1.9182 | 16.900 |
| *Colobus guezara* | 4 | 11 | 14.2 | 13.325 | 1.5521 | 11.648 |
| *Mandrillus sphinx* | 1 | 12.3 | 12.3 | | | |

Table 3.23. Descriptive statistics of the humerus maximum proximo-distal length of olecranon fossa (MPDLO)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 9 | 9.8 | 19 | 11.9956 | 3.1772 | 26.48 |
| *Cercopithecus aethiops* | 8 | 4.9 | 9.62 | 6.8 | 1.5097 | 22.201 |
| *Colobus guezara* | 4 | 8 | 11 | 9.2 | 1.4697 | 15.974 |
| *Mandrillus sphinx* | 1 | 11 | | | | |

Table 3.24. Descriptive statistics of the humerus axis of medial epicondyle (AME)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 30 | 40 | 38 | 3.496 | 9.200 |
| *Cercopithecus aethiops* | 9 | 34 | 44 | 38.555 | 2.9202 | 7.574 |
| *Colobus guezara* | 4 | 23 | 30 | 27 | 3.559 | 13.181 |
| *Mandrillus sphinx* | 40 | 40 | 40 | | | |

The Ulna

Table 3.25. Descriptive statistics of the ulna anterior-posterior length of olecranon process (APLOP)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 8 | 22 | 34 | 25.7013 | 3.5746 | 13.908 |
| *Cercopithecus aethiops* | 7 | 7.9 | 16.9 | 12.5829 | 3.2918 | 26.160 |
| *Colobus guezara* | 4 | 7.4 | 16.1 | 12.7 | 3.8549 | 30.353 |
| *Mandrillus sphinx* | 2 | 6 | 10.3 | 8.15 | 3.0406 | 37.307 |

Table 3.25. Descriptive statistics of the ulna proximo-distal height of olecranon process (PDHOP)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 8 | 10 | 16.15 | 3.1255 | 3.1255 | 25.996 |
| *Cercopithecus aethiops* | 7 | 6 | 10.82 | 8.5514 | 2.606 | 30.474 |
| *Colobus guezara* | 4 | 7.4 | 16.1 | 12.7 | 3.8549 | 30.353 |
| *Mandrillus sphinx* | 2 | 6 | 10.3 | 8.15 | 3.0406 | 37.3071 |

Table 3.26. Descriptive statistics of the ulna medio-lateral breadth of olecranon process (MLBOP)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 8 | 11 | 15 | 12.8588 | 1.3093 | 10.182 |
| *Cercopithecus aethiops* | 7 | 7.24 | 9.48 | 7.95 | 0.7302 | 9.183 |
| *Colobus guezara* | 4 | 9.5 | 11.8 | 10.75 | 0.9469 | 8.808 |
| *Mandrillus sphinx* | 2 | 10.2 | 11 | 10.6 | 0.5657 | 5.336 |

Table 3.27. Descriptive statistics of the ulna Proximo-distal length of trochlea notch (PDLTN)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 7 | 14.2 | 18.9 | 17.0262 | 1.9085 | 11.209 |
| *Cercopithecus aethiops* | 6 | 7.6 | 11.8 | 9.765 | 1.407 | 14.4680 |
| *Colobus guezara* | 4 | 11.2 | 14.1 | 12.325 | 1.242 | 10.0768 |
| *Mandrillus sphinx* | 2 | 13 | 13 | 13 | | |

The radius

Table 3.28. Descriptive statistics of the radius maximum dimension of radial head (MDRH)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 9 | 14.2 | 18 | 16.437 | 1.2932 | 7.86 |
| *Cercopithecus aethiops* | 8 | 8.5 | 9.1 | 9.4387 | 0.6062 | 6.4226 |
| *Colobus guezara* | 8 | 7.9 | 16 | 13.3 | 3.6615 | 27.5301 |
| *Mandrillus sphinx* | 2 | 15 | 15.2 | 15.1 | 0.1414 | 0.936 |

Table 3.29. Descriptive statistics of perpendicular breadth of radial head (PBRH)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 9 | 9.5 | 16.8 | 15.0544 | 2.1927 | 14.564 |
| *Cercopithecus aethiops* | 8 | 7.8 | 9.37 | 8.6563 | 0.571 | 6.595 |
| *Colobus guezara* | 4 | 11 | 13.4 | 11.975 | 1.034 | 8.6346 |
| *Mandrillus sphinx* | 2 | 13.1 | 14 | 13.55 | 0.6364 | 4.6966 |

Table 3.30. Descriptive statistics of the radius proximo distal height of radial neck (PDHRN)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| *Papio sp* | 8 | 4.9 | 8 | 6.57 | 0.9121 | 13.882 |
| *Cercopithecus aethiops* | 8 | 4 | 8.5 | 5.7525 | 1.4849 | 25.813 |
| *Colobus guezara* | 4 | 6 | 13.3 | 7.875 | 3.617 | 45.929 |
| *Mandrillus sphinx* | 2 | 5.9 | 7 | 6.45 | 0.7778 | 12.059 |

Table 3.31. Descriptive statistics of the radius proximo distal height of radial neck and head (PDHRNH)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 8 | 12 | 15.41 | 12.8889 | 1.1756 | 9.1213 |
| *Cercopithecus aethiops* | 8 | 7.1 | 13 | 9.4112 | 1.7394 | 18.482 |
| *Colobus guezara* | 4 | 7.2 | 15 | 10.65 | 3.2919 | 30.909 |
| *Mandrillus sphinx* | 2 | 12 | 12 | | | |

The femur

Table 3.32. Descriptive statistics of the femur anterior posterior head dimension (APHD)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 20.9 | 25 | 22.222 | 1.7871 | 8.0421 |
| *Cercopithecus aethiops* | 7 | 10.9 | 13.23 | 12.134 | 0.9391 | 7.7390 |
| *Colobus guezara* | 4 | 16 | 17.8 | 17.05 | 0.7937 | 4.6552 |
| *Mandrillus sphinx* | 2 | 17.5 | 17.9 | 17.7 | 0.2828 | 15.9798 |

Table 3.33. Descriptive statistics of the femur medio-lateral breadth of femur head (MLBFH)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 17.5 | 22 | 18.739 | 1.324 | 7.0655 |
| *Cercopithecus aethiops* | 7 | 8.2 | 10.98 | 10.2286 | 0.9629 | 9.4138 |
| *Colobus guezara* | 4 | 12.8 | 15.7 | 14.025 | 1.2121 | 8.642 |
| *Mandrillus sphinx* | 2 | 14.9 | 19.9 | 17.4 | 3.5355 | 20.3191 |

Table 3.34. Descriptive statistics of the femur greater trochanter projection (GTP)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 9 | 9.5 | 14 | 11.5433 | 1.408 | 12.1973 |
| *Cercopithecus aethiops* | 8 | 4.6 | 7.97 | 5.795 | 1.225 | 21.1397 |
| *Colobus guezara* | 4 | 6 | 9.1 | 7.1 | 1.3736 | 19.345 |
| *Mandrillus sphinx* | 2 | 6.6 | 7.4 | 7 | 0.5657 | 8.081 |

Table 3.35. Descriptive statistics of the radius neck diameter (ND)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 9.11 | 21 | 15.867 | 3.1955 | 20.141 |
| *Cercopithecus aethiops* | 8 | 3.8 | 12.6 | 8.3288 | 2.4907 | 29.904 |
| *Colobus guezara* | 4 | 9 | 16 | 13.5 | 3.1091 | 23.030 |
| *Mandrillus sphinx* | 2 | 8.7 | 9 | 8.85 | 0.2121 | 2.396 |

Table 3.36. Descriptive statistics of the femur medio-lateral neck diameter (MLND)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 4 | 12.1 | 8.444 | 2.3671 | 28.0334 |
| *Cercopithecus aethiops* | 8 | 4 | 12.6 | 5.9463 | 2.915 | 49.0221 |
| *Colobus guezara* | 5 | 6.5 | 13.2 | 7.92 | 3.2813 | 41.430 |
| *Mandrillus sphinx* | 2 | 6 | 7 | 6.5 | 0.7071 | 10.878 |

Table 3.37. Descriptive statistics of the femur bi-epicondylar breadth (BEB)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 28.5 | 42 | 35.477 | 3.6518 | 10.2933 |
| *Cercopithecus aethiops* | 7 | 18 | 22.38 | 20.72 | 1.5918 | 7.6822 |
| *Colobus guezara* | 4 | 28 | 32.5 | 30.6 | 1.8815 | 6.148 |
| *Mandrillus sphinx* | 2 | 29 | 31.3 | 30.15 | 1.6262 | 5.394 |

Table 3.38. Descriptive statistics of the radius neck shaft angle (NSA)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 120 | 145 | 128.7 | 8.4202 | 6.542 |
| *Cercopithecus aethiops* | 8 | 100 | 145 | 117.625 | 15.9458 | 13.5564 |
| *Colobus guezara* | 4 | 127 | 140 | 133 | 5.7155 | 4.2973 |
| *Mandrillus sphinx* | 2 | 125 | 135 | 133 | 5.7155 | 4.2973 |

Table 3.39. Descriptive statistics of the femur medial condyle width (MCW)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 11 | 18 | 12.244 | 2.9415 | 24.024 |
| *Cercopithecus aethiops* | 8 | 5.5 | 8.54 | 7.2275 | 0.8526 | 11.7966 |
| *Colobus guezara* | 4 | 8.1 | 11.6 | 10.375 | 1.5543 | 14.9811 |
| *Mandrillus sphinx* | 2 | 13 | 17.5 | 15.25 | 3.182 | 20.8654 |

Table 3.40. Descriptive statistics of the femur radius lateral condyle width (LCW)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 8 | 12 | 10.22 | 1.263 | 12.357 |
| *Cercopithecus aethiops* | 8 | 5 | 7.9 | 6.5363 | 0.8658 | 1.2245 |
| *Colobus guezara* | 4 | 8.1 | 11 | 10.175 | 1.3961 | 13.7211 |
| *Mandrillus sphinx* | 2 | 8.2 | 9.7 | 8.95 | 1.0607 | 11.8509 |

### 3.4.2. *Results of the Bivariate Regression Analysis*

Bivariate regression analysis was run to establish the relationship and strength of association between skeletal traits found in the Sterkfontein fossil cercopithecid postcranial assemblage.

a) The humerus

Five humeral traits were assessed for strength of correlation: the anterior posterior length of humeral head and medio-lateral width of humeral head; maximum proximo-distal length of olecranon and maximum medio-lateral breadth of olecranon; humeral distal articulation and maximum medio-lateral breadth of olecranon fossa; the width of distal humeral articulation and bi-epicondylar width and; width of distal humeral articulation and width of distal trochlea.

Bivariate analysis for the anterior posterior length of humeral head and medio-lateral width of humeral head (Fig. 3.10) suggests a strong positive relationship ($r = 0.9$) between the two traits. Data for the medio-lateral width of the olecranon fossa and proximo-distal length of olecranon fossa was only derived from 10 specimens. Bivariate

analysis of maximum proximo-distal length of olecranon and maximum medio-lateral breadth of olecranon (Fig. 3.11) led to a correlation (r) of 0.605, which suggests a positive linear correlation. The same analysis for the width of distal humeral articulation and bi-epicondylar width (Fig. 3.12) shows a strong positive Correlation (r = 0.9) between the two traits. The fourth index, humeral distal articulation and maximum medio-lateral breadth of olecranon fossa (Fig. 3.13) shows a strong positive relationship, r = 0.8. Bivariate analysis of the fifth index, width of distal humeral articulation and length of distal trochlea (Fig. 3.14) shows a strong positive relationship between the distal articulation and the width of the trochlea.

Table 3.41. Legend for the statistical plots.

| **Tribe** | **Colour** | **Symbol** | **Genus** |
|---|---|---|---|
| Colobines | red | dot | *Colobus* |
| | red | square | *Procolobus* |
| | red | open square | *Rhinocolobus* |
| | red | x (letter) | *Cearcopithecoides* |
| Cercopithecini | black | diamond | *Cercopithecus* |
| | black | star | *Chlorocebus* |
| Papionins | black | triangle | *Papio* |
| | black | inverted triangle | *Parapapio* |
| | black | Fill triangle | *Theropithecus* |
| | black | dash | *Mandrillus* |
| Papionins (Sterkfontein Fossils) | aqua | bar | *Papionin* |
| | aqua | triangle | *Papio* |
| | aqua | inverted triangle | *Parapapio* |
| | aqua | Fill inverted triangle | *Papio/parapapio* |
| | aqua | Fill triangle | *Theropithecus* |

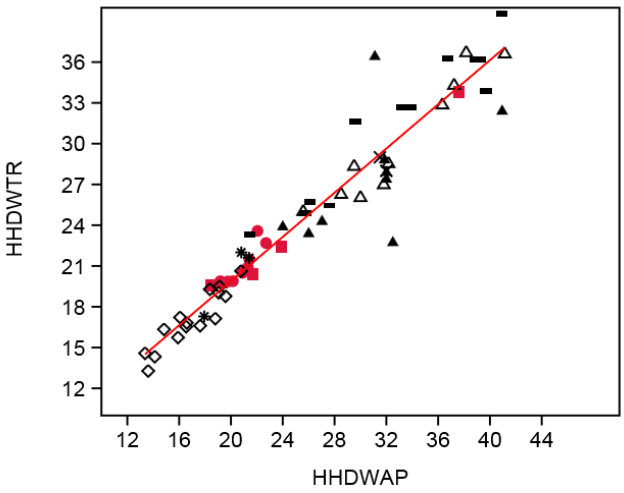


Figure 3.10. Bivariate plot for ‘anterior posterior length of humeral head (HHDWAP) and medio-lateral width of humeral head (HHDWTR)’.

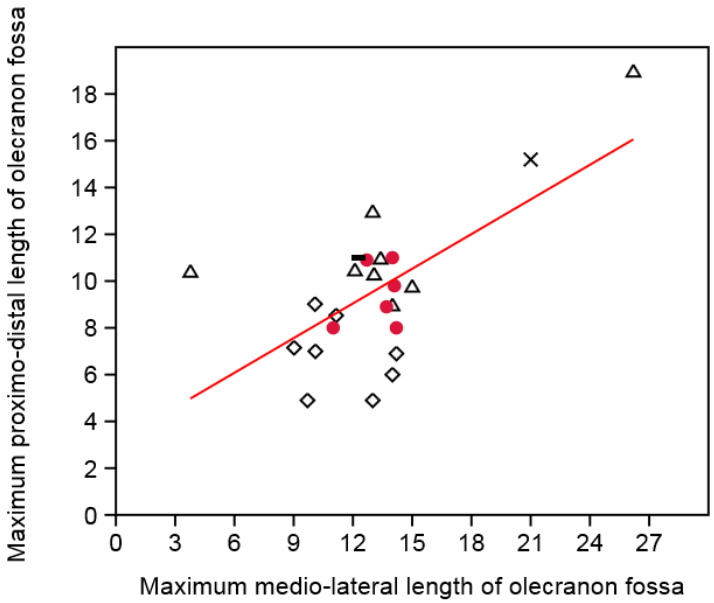


Figure 3.11. Bivariate plot for ‘maximum proximo-distal length of olecranon fossa and maximum medio-lateral lateral length of olecranon fossa’.

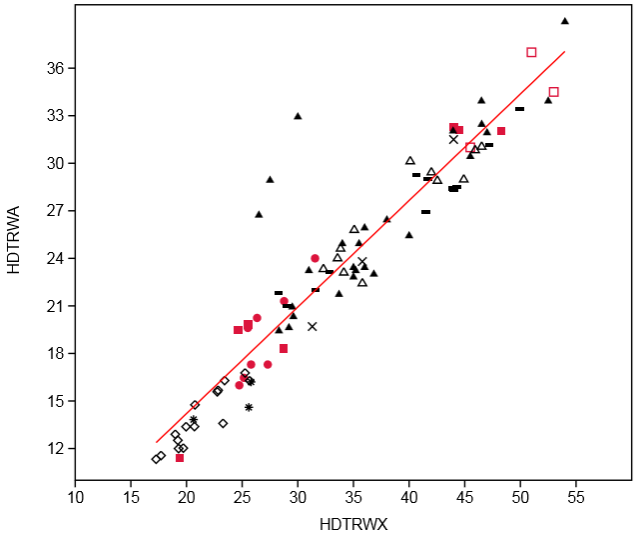


Figure 3.12. Bivariate plot for 'width of distal humeral articulation (HDTRWA) and bi-epicondylar width (HDTRWX) '.

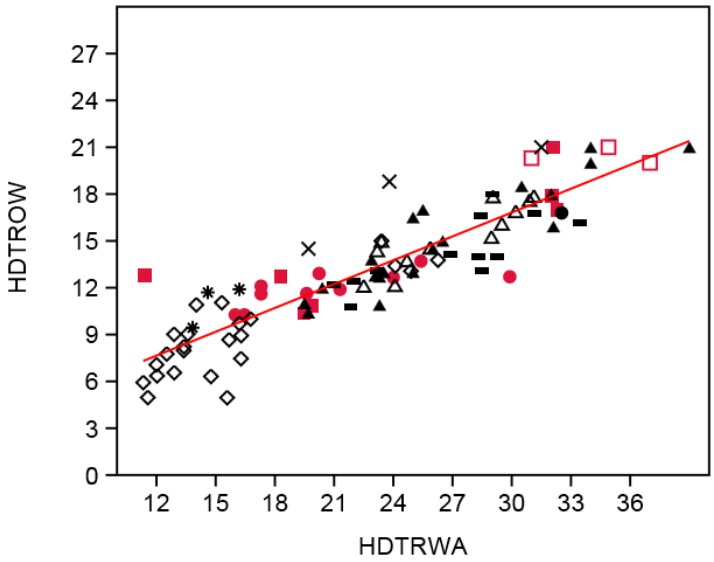


Figure 3.13. Bivariate plot for 'humeral distal articulation (HDTRWA)and maximum medio-lateral breadth of olecranon fossa (HDTROW)'.

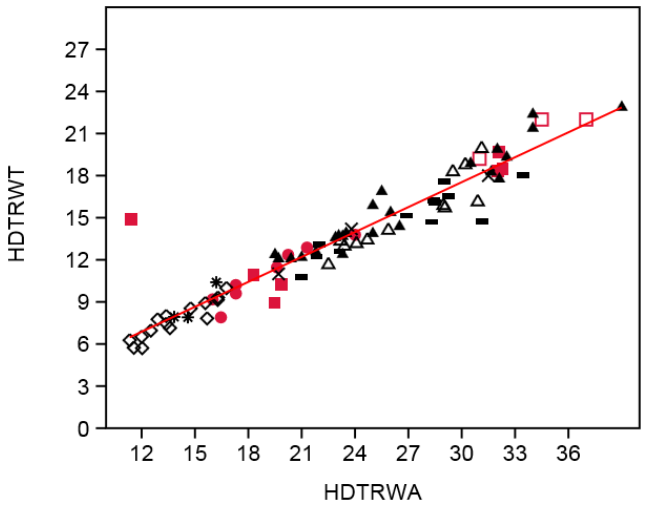


Figure 3.14. Bivariate plot for ‘width of distal humeral articulation and length of distal trochlea’.

b. The ulna

Bivariate regression analysis of the ulna olecranon height and trochlea notch length (Fig. 3.15) shows a strong positive correlation (r = 0.86) between the two traits. A similar analysis for ulna proximo-distal height of olecranon and anterior-posterior length of olecranon (Fig 3.16) shows a very weak correlation (r= 0.3). The same weak correlation of r=0.3 was reached when undertaking a bivariate regression analysis of olecranon proximo-distal length and trochlea notch proximo-distal length (Fig 3.17). On the ulna, other traits which demonstrate a strong positive correlation (r=0.9) are the trochlea notch proximo-distal height and medio-lateral breath (Fig 3.18).

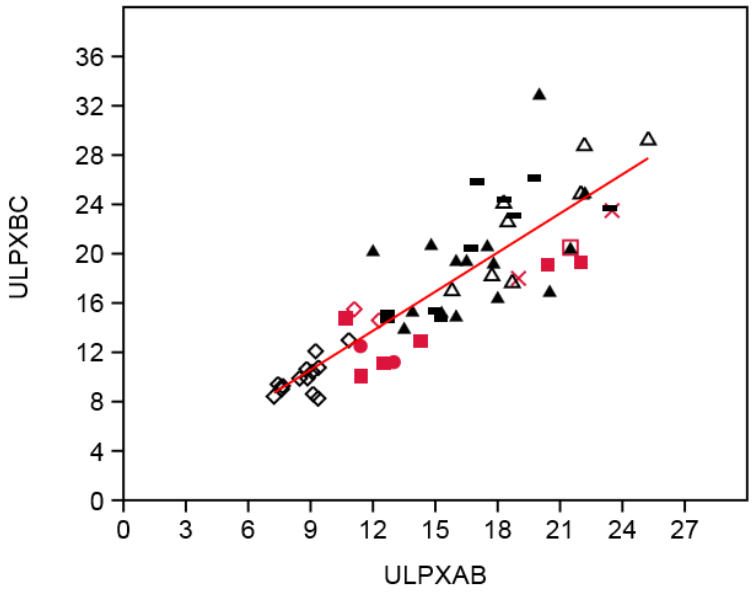


Figure 3.15. Bivariate plot for ‘ulna olecranon to anterior proximal trochlea notch and trochlea notch length’.

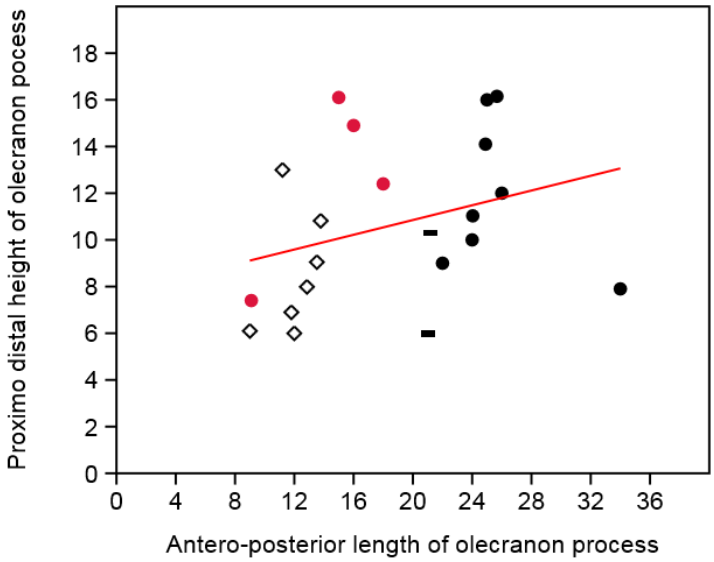


Figure 3.16. Bivariate plot for ‘ulna proximo-distal height of olecranon and anterior-posterior length of olecranon process’.

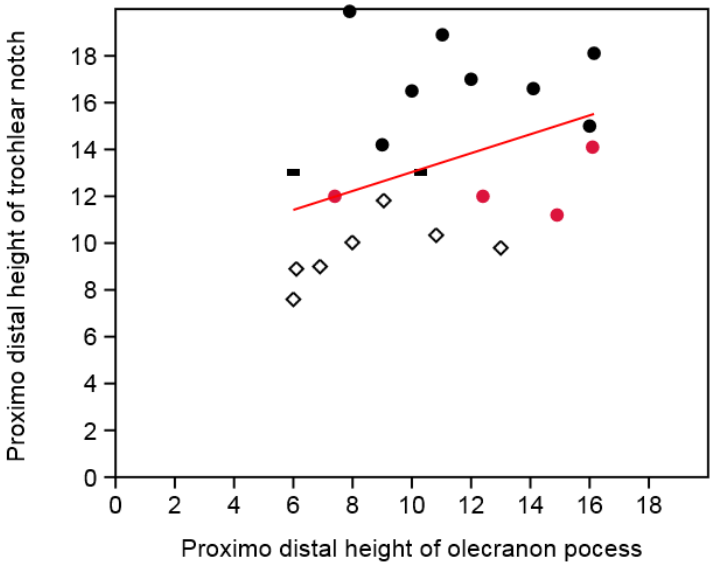


Figure 3.17. Bivariate plot for ‘olecranon proximo-distal length and trochlea notch proximo-distal length’.

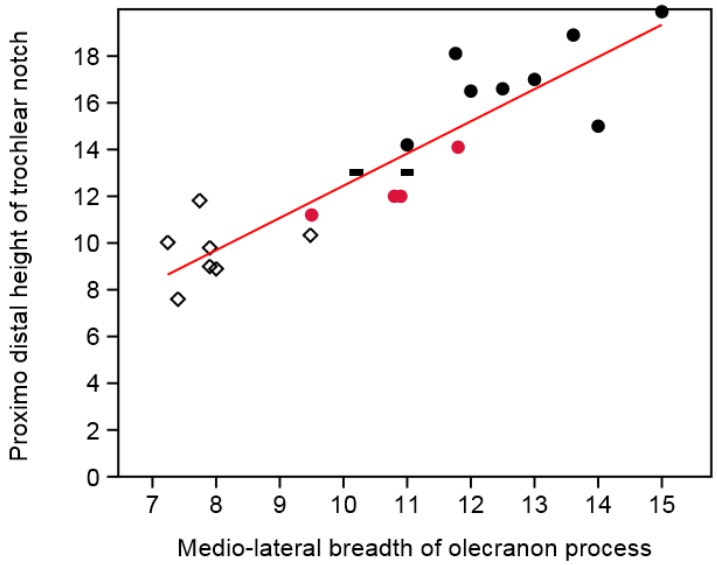


Figure 3.18. Bivariate plot for ulna ‘proximo-distal height of trochlea notch and medio-lateral breadth of trochlea notch’.

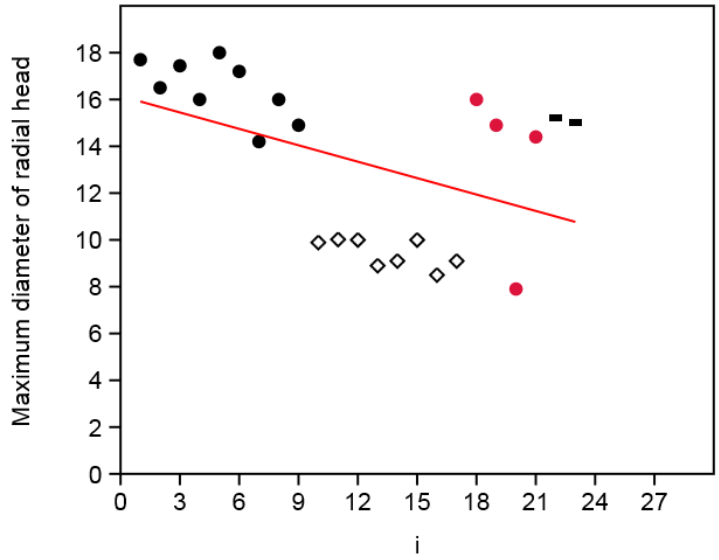


Figure 3.19. Bivariate plot for ‘maximum diameter of radial head and perpendicular width of radial head’.

The radius

No strong correlation exists in the radius indices studied. The maximum diameter of radial head and perpendicular breadth of radial head (Fig.3.19) have a moderate negative correlation (r= -0.45). The radius neck anterior-posterior and medio-lateral breadth bivariate analysis (Fig. 3.20) illustrated a positive relationship between the two variables, r = 0.5.

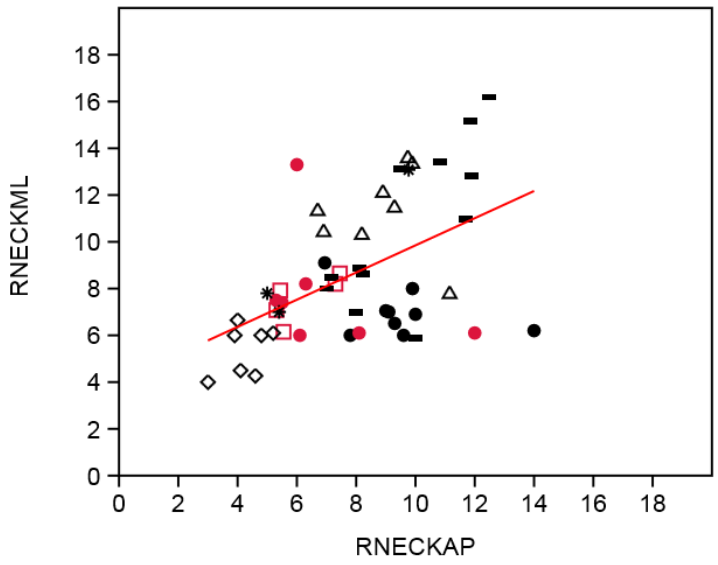


Figure 3.20. Bivariate plot for the ‘radius neck anterior-posterior and medio-lateral breadth of radial neck’.

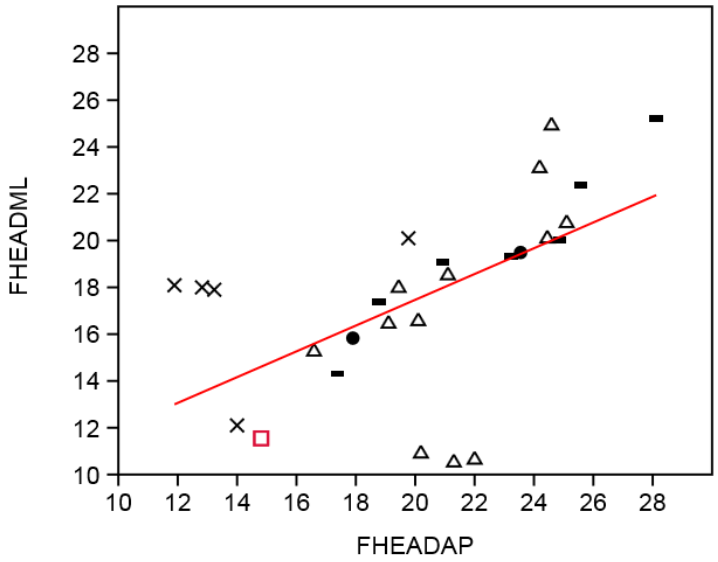


Figure 3.21. Bivariate plot for femur anterior-posterior neck breadth and medio-lateral neck width'.

c) The femur

Only one index showed a positive correlation on the femur. Bivariate analysis for the femur head medio-lateral width and anterior-posterior neck breadth (Fig 3.21) demonstrated a moderate positive correlation, r = 0.5.

3.4.3. *Results for the Univariate Analysis of Variance (ANOVA)*

a) Humerus

The following variables were tested for statistical significance and none were found to indicate statistical significance among the four genera (*Colobus*, *Cercopithecus*, *Mandrillus* and *Papio*): humeral head anterior-posterior length, and humeral head medio-lateral breadth; width of distal humerus and width of distal humerus articulation; width of humeral trochlea and humeral trochlea length and distal humerus anterior-posterior width and maximum medio-lateral width of olecranon fossa. The lateral epicondyle breadth to medial edge of trochlea and distal articular breadth at $p<0.05$ ($p=0.0103$; $F=7.097$). Bonferroni corrected p values are at 0.0081 for both the lateral epicondyle breadth to medial edge of trochlea and the distal articular breadth.

b) Ulna

On the ulna, none of the following variables demonstrated statistical significance, ($p>0.05$): the ulna olecranon height and olecranon anterior posterior length; the ulna trochlea notch height and ulna length from coronoid process to proximal olecranon. For control and to establish if other traits on the ulna, which are not necessarily preserved in the fossil remains, are capable of showing statistical significance, the ulna length and trochlea notch height was also run through ANOVA and the same conclusion (not statistically significant; $p>0.05$) was also reached. The olecranon proximo-distal height and trochlea proximo-distal height shows statistical significance ($p= 0.01121$; $F=7.039$). Bonferroni corrected p values are at 0.0169 for both traits.

c) Radius

On the radius, the proximo-distal height of radial neck and head and the radial neck medio-lateral width demonstrated a significant positive relationship ($p=0.0278$; $F= 5.208$). Bonferroni corrected values are (p) 0.03634 for both traits. Significance is also found for the anterior posterior radius shaft and medio-lateral radial diameter ($P= 0.00215$; $F=10.69$). Bonferroni corrected p values are 0.01016 for both traits No statistical significance is recorded for radial length and proximo-distal length of radius from bicipital tuberosity to distal styloid process. ($p>0.05$). No significance was also found for radius neck anterior posterior length and neck medio lateral breadth ($p>0.05$)

d) Femur

On the femur, only the antero-posterior length of head and medio-lateral width of head index point to positive statistical significance, $p=0.03095$, $F=4.909$. Bonferroni $p = 0.03117$.

### 3.4.5. *Results of the Discriminant Function Analysis (DFA)*

DFA undertaken on the humerus from modern comparative monkeys suggest that a large percentage of the specimens were classified correctly (92.86%). The DFA plot shows

separation between the different genera (Figure 3.22). Higher variation in the groups is observed in axis one which is at 84% (Table 3.42).

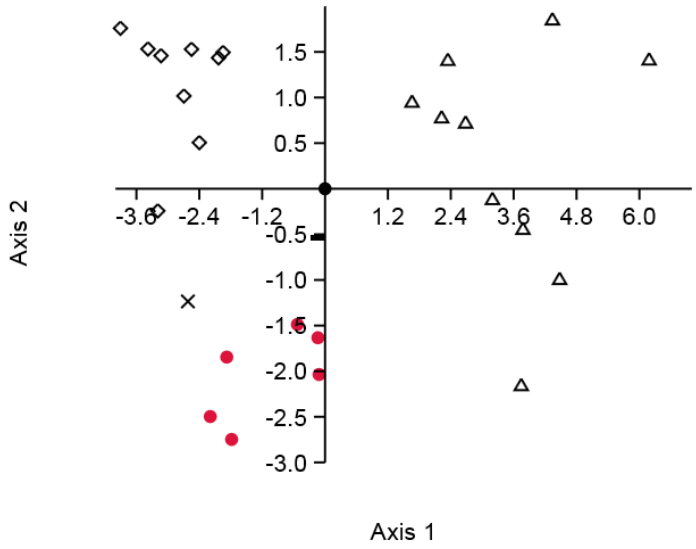


Figure 3.22. Discriminant analysis plot for modern comparative humerus based on genera

Table 3.42. Eigenvalue and percent values for DFA results for modern comparative humerus based on genera

| Axis | Eigenvalue | Percent |
|---|---|---|
| 1 | 8.552 | 84.27 |
| 2 | 1.457 | 14.39 |
| 3 | 0.13609 | 1.344 |

Table 3.43. Results for humerus, DFA Classification by genus

| Point | Given group | Classification | Jackknifed |
|---|---|---|---|
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecoides williamsi* | 2 | 3 | 3 |
| Colobinae indet | 3 | 3 | 3 |
| Colobinae indet | 3 | 3 | 3 |
| *Colobus guezara* | 3 | 4 | 4 |
| *Colobus guezara* | 3 | 3 | 4 |
| *Colobus guezara* | 3 | 3 | 3 |
| *Colobus guezara* | 3 | 3 | 3 |
| *Mandrillus sphinx* | 4 | 4 | 4 |
| *Mandrillus sphinx* | 4 | 4 | 3 |

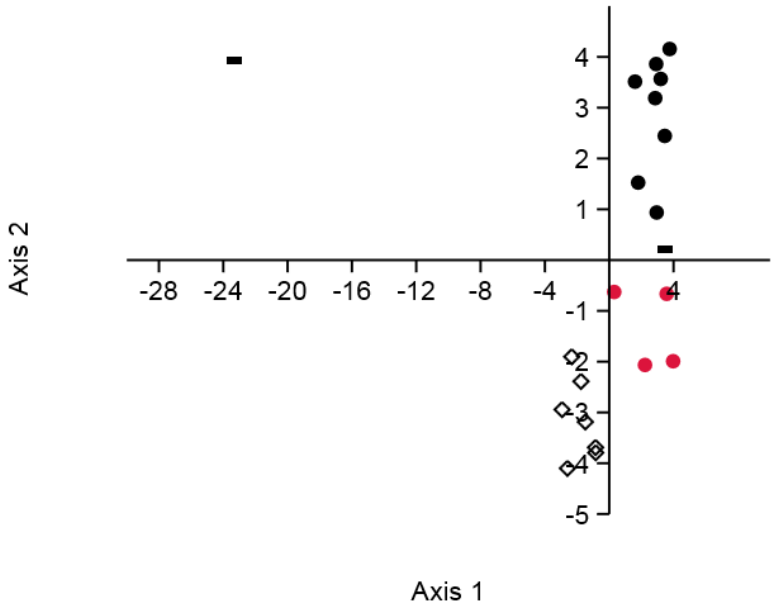


Figure 3.23.Discriminant analysis plot for modern comparative ulna based on genera

On the ulnae all of the specimens were correctly classified at 100%. The box plot (Fig 3.23) demonstrates distinction between the genera. Eigenvalues suggest (Table 3.43) that higher variability is observed in axis 1 at 79%.

Table 3.44. Eigenvalue and percent values for DFA results for modern comparative ulna based on genera

| Axis | Eigenvalue | Percent |
|---|---|---|
| | | |
| 1 | 39.197 | 79.79 |
| 2 | 9.2422 | 18.81 |
| 3 | 0.68762 | 1.4 |

Table 3.45. Results for ulna DFA Classification by genus

| Specimen no | Genus | Given group | Classification | Jackknifed |
|---|---|---|---|---|
| ZA 1227 | *Papio* sp | 1 | 1 | 3 |
| Za 1226 | *Papio* sp | 1 | 1 | 1 |
| Za 1228 | *Papio* sp | 1 | 1 | 1 |
| Za 1299 | *Papio* sp | 1 | 1 | 1 |
| Za 740 | *Papio* sp | 1 | 1 | 1 |
| Za 1357 | *Papio* sp | 1 | 1 | 1 |
| Za 1232 | *Papio* sp | 1 | 1 | 3 |
| Za 1231 | *Papio* sp | 1 | 1 | 3 |
| Za12s | *Cercopithecus aethiops* | 2 | 2 | 2 |
| V33 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Za 973 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Za 968 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Za 1224 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Za 864 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Za 862 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| A2 981 | *Colobus guuezara* | 3 | 3 | 3 |
| A2 1437 | *Colobus guezara* | 3 | 3 | 3 |
| A2/807 | *Colobus guezara* | 3 | 3 | 2 |
| A2/155 | *Colobus guezara* | 3 | 3 | 2 |
| A2/1971 | *Colobus guezara* | 3 | 3 | 1 |
| A2/1972 | *Mandrillus sphinx* | 4 | 4 | 2 |

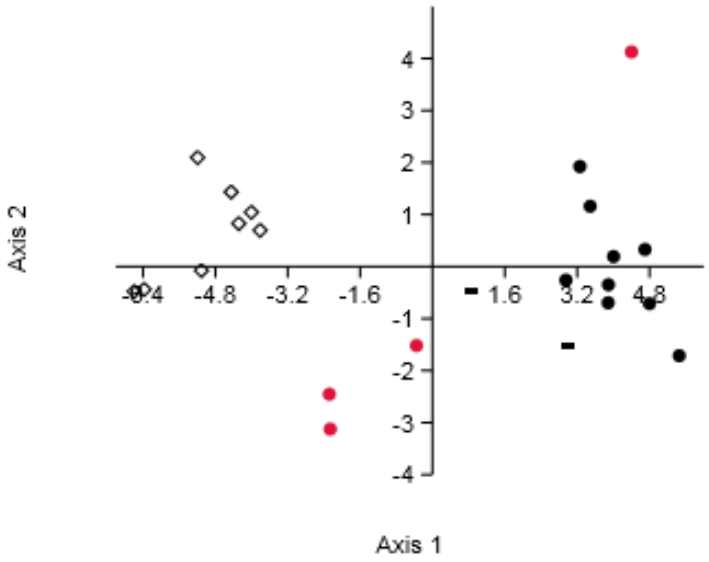


Figure 3.24.Discriminant analysis plot for modern comparative radius based on genera

The discriminant function for radii showed a perfect score, with 100% of the specimens correctly classified. More variation is observed in axis one which accounts for 96% of the difference (Fig 3.24; Table 3.46).

Table 3.46. Eigenvalue and percent values for DFA results for modern comparative radius based on genera.

| Axis | Eigenvalue | Percent |
|---|---|---|
| 1 | 11.986 | 96.34 |
| 2 | 0.4581 | 3.656 |

Table 3.47. Results for radius DFA Classification by genus

| Point | Given group | Classification | Jackknifed |
|---|---|---|---|
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 1 | 1 |
| *Papio* sp | 1 | 3 | 3 |
| *Papio* sp | 1 | 1 | 3 |
| Papio *sp* | 1 | 1 | 1 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Cercopithecus aethiops* | 2 | 2 | 2 |
| *Colobus guezara* | 3 | 3 | 2 |
| *Colobus guezara* | 3 | 3 | 3 |
| *Colobus guezara* | 3 | 3 | 2 |
| *Colobus guezara* | 3 | 3 | 1 |
| *Mandrillus sphinx* | 3 | 1 | 1 |
| *Mandrillus sphinx* | 3 | 3 | 3 |

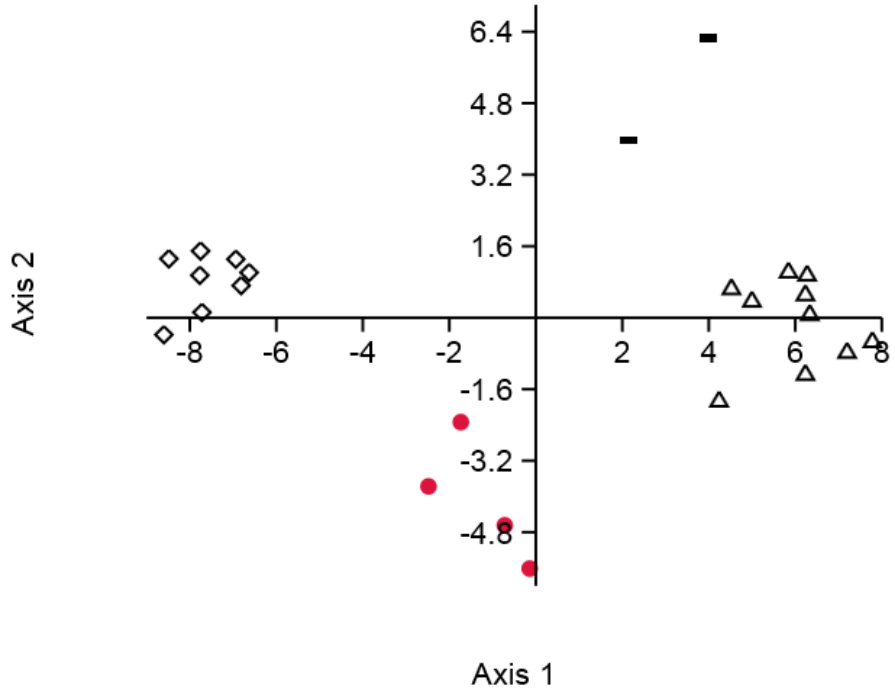


Figure 3.25. Discriminant analysis plot for modern comparative femur based on genera

Results of the discriminant function for the femur showed a 100% score for the classification. More distinction is observed in Axis one which is 86% of the variation (Fig 3.25; Table 3.48).

Table 3.48. Eigenvalue and percent values for DFA results for modern comparative femora based on genera

| Axis | Eigenvalue | Percent |
|---|---|---|
| 1 | 22.42 | 86.98 |
| 2 | 2.3034 | 8.936 |
| 3 | 0.85187 | 3.305 |
| 4 | 0.1931 | 0.7492 |

Table 3.49. Results for femur DFA Classification by genus

| Point | Species | Given group | Classification | Jackknifed |
|---|---|---|---|---|
| Za 1227 | *Papio* sp | 1 | 1 | 1 |
| Za 1226 | *Papio* sp | 1 | 1 | 1 |
| Za 1228 | *Papio* sp | 1 | 1 | 1 |
| BPI/C 541 | *Papio* sp | 1 | 1 | 1 |
| Za 1360 | *Papio* sp | 1 | 1 | 1 |
| Za 740 | *Papio* sp | 1 | 1 | 1 |
| Za 1357 | *Papio* sp | 1 | 1 | 33 |
| Za 1232 | *Papio* sp | 1 | 1 | 1 |
| Za 1231 | *Papio* sp | 1 | 1 | 1 |
| V33 | *Cercopithecus aethiops* | 2 | 2 | 22 |
| Za 973 | *Cercopithecus aethiops* | 2 | 22 | 22 |
| BPI/C 294 | *Cercopithecus aethiops* | 2 | 22 | 22 |
| Za 12s | *Cercopithecus aethiops* | 2 | 2 | 22 |
| Za 968 | *Cercopithecus aethiops* | 2 | 22 | 22 |
| Za 1244 | *Cercopithecus aethiops* | 22 | 22 | 2 |
| Za 864 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Za 862 | *Cercopithecus aethiops* | 2 | 2 | 2 |
| Az/981 | *Colobus guezara* | 3 | 3 | 22 |
| Az 1437 | *Colobus guezara* | 3 | 3 | 4 |
| Az 807 | *Colobus guezara* | 3 | 3 | 2 |
| A2/155 | *Colobus guezara* | 33 | 33 | 1 |
| A2/1971 | *Mandrillus sphinx* | 4 | 4 | 1 |
| A2/1972 | *Mandrillus sphinx* | 4 | 4 | 4 |

### 3.4.6. *Summary of the statistical analysis*

Quantitative analysis undertaken through bivariate regression analysis suggests positive correlation of the traits studied on the humerus, the ulna, the radius and the femur. However, the humerus and the ulna are the only two skeletal elements with traits which are strongly associated. On the humerus, all indices showed a positive correlation. However, strong correlation was observed on the following variables a) width of distal humeral articulation and bi-epicondylar width; b) humeral distal articulation and maximum medio-lateral breadth of olecranon fossa, and c) width of distal humeral articulation and length of distal trochlea.

On the ulna, only two indices proved to have a strong positive relationship: a) the ulna olecranon height and trochlea notch length, and, b) the trochlea notch proximo-distal height and medio-lateral breath. No strong correlation exists in the radius indices studied. The radius neck anterior-posterior and medio-lateral breadth bivariate analysis showed a moderate correlation. The femur head medio-lateral breadth and anterior-posterior length was the only femur index studied, and it showed positive association.

The Univariate Analysis of Variance demonstrated statistical significance on one index of the humerus (distal articular breadth and medial trochlea flange length) and one of the ulna (the trochlea notch proximo-distal height and olecranon process proximo-distal height). The radial neck (anterior posterior diameter and medio-lateral width as well as the neck height and neck and head length) proved statistically significant among the genera. The femur neck, anterior posterior width and medio-lateral length also showed statistical significance.

The discriminant function analysis of the modern comparative materials establishes that all analysed skeletal elements show success of classification and variability among the four genera. These complement skeletal parts are fully preserved, which is a different scenario from the highly fragmented Sterkfontein cercopithecoid remains. A multivariate analysis such as DFA will not be possible to conduct as it requires multiple variables and more than two groups to conduct.

### 3.5. Identification of specific carnivore agents

The methodology follows Dominguez-Rodrigo & Piqueras (2003) model for assessing tooth-pith data. This method was applied by Pickering *et al*. (2004c) on carnivore tooth pits in the Swartkrans Member 3 fossil assemblage.

Digital calipers are used to measure tooth pits and scores. These were categorized based on size and location (either occurring on the diaphysis or occurring on the epiphysis) on the bone. Carnivore categories considered in this study are small canids, middle sized carnivores, felids, large sized carnivores, hyaenas and dogs.

For the length on epiphyses

- Pits less than 4mm are assigned to small canids;
- Pits which range between 4mm and 6mm are assigned to middle sized carnivores and felids were excluded from this category; and
- All pits larger than 6mm were assigned to large carnivores and felids.

For the pit breadth of epiphysis

- Pits less than 4mm are assigned to small canids;
- Pits which range between 4mm and 6mm are assigned to middle sized carnivores and felids were excluded from this category; and
- All pits larger than 6mm are assigned to large carnivores and felids.

Measurements derived from tooth pits which occur in the diaphyses are grouped according to the length and breadth and each have two categories:

For tooth pit length-

- Pits less than 2mm are assigned to small carnivores to medium felids; and
- Pits which measure above 4mm are assigned to hyaenas, dogs and lions

For tooth pit breadth-

- Pits less than 1.5mm are assigned to small carnivores; and

- Pits which measure above 2mm are assigned to hyaenas, dogs and lions

In addition to tooth pit sizes, other taphonomic factors such as analysis of skeletal element frequencies are considered to provide a comprehensive assessment of the observed results.

### 3.6. Skeletal element spatial clustering

Fossil cercopithecoid assemblages from Member 2, Jacovec Cavern, Member 4, StW 53 infill, Member 5 and Member 6 and Post Member 6 are investigated for spatial distribution within each infill. Even though squares do not necessarily reflect any discrete palaeoenvironmental spatial arrangement, data derived from spatial clustering is useful for taphonomic investigations. Temporal and chronological spatial clustering of all specimens is plotted to determine the spatial arrangement of the specimens in their respective deposits within the cave system. The relationship between the original cave opening at the time of accumulation, the taphonomic imprint within the assemblage and the spatial clustering patterns are discussed.

# CHAPTER FOUR

# RESULTS: TAXONOMY OF THE STERKFONTEIN FOSSIL CERCOPITHECOID POSTCRANIA

## 4.1. Systematic Palaeontology of the Sterkfontein fossil cercopithecid postcrania

### 4.1.1. Qualitative Analysis

Anatomical descriptions and comparative observations made in the qualitative analysis point to the Sterkfontein fossil cercopithecid postcrania assemblage which comprises of a minimum of two subfamilies, Cercopithecinae and Colobininae and five genera, *Papio, Parapapio, Theropithecus, Cecopithecoides* and *Cercopithecus*.. Sixty-three elements, which constitute 24% of the NISP, cannot be differentiated between *Papio* and *Parapapio,* and therefore a general category *Papio*/*Parapapio* is utilised. Due to the high fragmentation level of the Sterkfontein fossil cercopithecoid assemblage no specimens could be identified to species level.

The most common genera identified are lumped into the *Papio*/*Parapapio* category with an NISP of 63. This is followed by *Papio* with 41 specimens identified. Humeri constitute the largest percentage of identified elements with an NISP of 85, constituting 32% of the total identified NISP, while femora are the least identified at NISP of 30, constituting 11 % of the total NISP. *Parapapio* specimens identified from the Sterkfontein assemblage display similar morphology, albeit with differing sizes, to known East African materials. Colobines are very limited in the assemblage; however, *Cercopithecoides* sp is tentatively assigned to one specimen.

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | *Parapapio.* Jones 1937 |

a) The humerus

Sixteen humeri are assigned to the *Parapapio* genus. These share the following fifteen characteristics; 1) the head has a hemi-spherical shape; 2) the greater tuberosity lies below the head; 3) the lateral surface of the greater tuberosity is convex; 4) the greater tuberosity is equal to or larger than the lesser tuberosity; and 5) the bicipital groove is shallow. On the distal humeri- 6) on the coronal plane the distal shaft medial and lateral aspects are asymmetrical; 7) on the coronal plane the distal shaft is thick and rounded; 8) the distal shaft's dorsal pillars are wider and thicker above the lateral epicondyle; 9) the medial epicondyle is narrower than the lateral epicondyle; 10) the medial epicondyle angle is retroflexed; 11) the lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa; 12) the trochlea breadth is narrow; 13) the trochlea medial lip distal projection is long and perpendicular to the shaft; 14) the capitulum is rounded and has an even width in the proximal-distal axis; it is not as protruding as observed in *Colobus* specimens 15) the olecranon fossa is deep with a triangular shape. These morphological traits are also observed on specimen KNM-ER 30322 assigned to *Parapapio cf. ado*, from Koobi Fora (Jablonski, Leakey & Anton 2008) and specimen EP 399/98 from Laetoli (Harrison 2011). Based on the morphological similarities and equal sizes of *Parapapio* and *Papio* specimens, the large size and extent of elevation of the greater tuberosity and the shape of the olecranon fossa are used to distinguish the humeri of the two genera.

- SWP 504 is a right proximal humerus with less than a third of the shaft preserved:
  The specimen head is broken off on the anterior-medial portion of the head. The head shape is hemi-spherical and is separated from the lesser tuberosity by a narrow groove. The greater tuberosity lateral surface is slightly convex. The superior extension of the greater tuberosity lies slightly below the head and is also larger in size than the lesser tuberosity.

- SWP 959 is a right proximal humerus:
  The head shape on this specimen is hemi-spherical. The bicipital groove is narrow. The lateral surface of the greater tuberosity is slightly convex. The superior extension of the greater tuberosity lies slightly below the head. It is larger in size than the lesser tuberosity.

- SWP 962, a left proximal humeral head with greater and lesser tuberosity:

The head shape is hemi-spherical and is separated from the lesser tuberosity by a narrow groove. The lateral surface of the greater tuberosity is slightly convex. The superior extension of the greater tuberosity lies slightly below the head. The greater tuberosity is larger than the lesser tuberosity, and it lies at the same level as the head.

- STS 2219, a right proximal humeral head with both the greater and lesser tuberosities preserved:
  The posterior portion of the specimen is embedded in breccia. The head shape is also hemi-spherical and is separated from the lesser tuberosity by a narrow groove. The lateral surface of the greater tuberosity is slightly convex. The superior extension of the greater tuberosity lies slightly below the head and is also larger in size than the lesser tuberosity.

- SWP 1137, a left distal humerus:
  The distal shaft's medial and lateral edges are asymmetrical. The distal shaft is also thick and rounded. The distal shaft's dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is narrower than the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow. The capitulum is pitted from possible carnivore chewing and its shape is therefore not easily discernible. The olecranon fossa is deep and triangular in shape.

- SWP 1262, a left distal humerus:
  The distal shaft's medial and lateral edges are oriented asymmetrically. The distal shaft is thick and rounded. The dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea is narrow and its distal projection is short and medially inclined in relation to humeral shaft. Viewed from the proximo-distal axis, the capitulum medio-lateral width is distally narrowed. The olecranon fossa is triangular in shape.

- SWP 1287, a left distal humerus:

This specimen's medial and lateral edges are oriented asymmetrically. The distal shaft is thick and rounded and its distal dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is approximately equal in width to the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to the humeral shaft. In the proximo-distal axis, the capitulum's medio-lateral width is distally narrowed. The olecranon fossa is rounded ellipsoid.

- SWP 1540, a left distal humerus with less than a third of the shaft preserved distally:
  The proximal part of the shaft is missing; however the shaft is straight. Its dimensions are average for the Sterkfontein cercopithecoid humeri. The distal shaft is rounded and wider and thicker above the lateral epicondyle. The medial epicondyle is approximately equal in width to the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. Trochlea breadth is narrow. Its medial lip distal projection is short and medially inclined relative to the medial shaft. The capitulum's medio-lateral width is distally narrowed in the proximo-distal axis. The olecranon fossa has a triangular shape.

- SWP 1589, a left distal humerus:
  This specimen is missing the medial epicondyle. The olecranon fossa is triangular. The distal shaft is thick and rounded. The lateral epicondyle has a small dorsal face with minimum projection above the olecranon fossa.

- SWP 4081, left distal humerus with more than half of the shaft preserved proximally:
  The shaft is approximately straight and the distal portion is thick and rounded. The dorsal pillars are wider and thicker above the lateral epicondyle. The supinator crest is sharply raised and approximately a third of the humeral shaft length. The medial epicondyle is narrower than the lateral epicondyle. It is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is long and perpendicular

to the humeral shaft. In the proximo-distal axis, the capitulum's medio-lateral width is narrower distally. The olecranon fossa has a triangular shape.

- SWP 1165, a right distal humerus:
  The specimen has medial and lateral edges which are asymmetrically oriented. The distal shaft is rounded and its dorsal pillars are wider and thicker above the lateral epicondyle. The olecranon fossa has a triangular shape. The medial epicondyle is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow. The medial lip distal projection is short and medially inclined relative to the humeral shaft. The capitulum has an even medio-lateral width in the proximo-distal axis.

- SWP 4006, a right distal humerus with less than a third of its shaft preserved distally:
  The humerus distal shaft morphology is thick and rounded, and the distal shaft's dorsal pillars above the lateral epicondyle are wider and thicker than they are above the medial epicondyle. The medial epicondyle is approximately equal in width to the lateral epicondyle. The specimen is one of the relatively larger specimens in the assemblage. The medial epicondyle is retroflexed. The trochlea breadth is narrow. The trochlea flange distal projection is short and medially inclined relative to the humeral shaft. The capitulum has an even medio-lateral width in the proximo-distal plane. The olecranon fossa shape is triangular.

- SWP 4036, a right distal humerus with distal shaft:
  The distal humeral shaft is thick and rounded. Its medial and lateral edges are asymmetrical. Dorsally, the lateral pillar is wider and thicker above the lateral epicondyle than it is above the medial epicondyle. The medial epicondyle is narrower than the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow. The trochlea medial lip is short and is medially inclined relative to humeral shaft. The capitulum medio-lateral width is distally narrowed when viewed in the proximo-distal axis. The olecranon fossa is triangular in shape.

- SWP 4047, right distal humerus:

The distal shaft's medial and lateral edges are asymmetrical. The distal shaft dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is narrower than the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow; it's medial lip distal projection is short and is medially inclined relative to the humeral shaft. The capitulum has a narrower medio-lateral width on its distal end. The olecranon fossa is triangular in shape.

- SWP 4248, a left distal humerus

  The distal shaft is asymmetrical. The distal lateral wall is wider and thicker above the lateral epicondyle. The olecranon is filled with breccia, however, it is deep with a triangular shape. The medial epicondyle is retroflexed. The trochlea distal lip is long and pronounced. The capitulum is rounded and defined, however it is modestly protuberant compared to *Colobus*.

Un-sided distal humerus

- SWP 1211, an unsided distal humerus with a shaft fragment:

  The medial and lateral edges of this specimen are oriented asymmetrically. The distal shaft is thick and rounded. The distal shaft dorsal pillar is wider and thicker above the lateral epicondyle. The medial epicondyle is narrower than the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow, and its medial lip is short and medially inclined relative to the humeral shaft. In the proximo-distal axis, the capitulum is medio-laterally narrowed in its distal end. The olecranon fossa has a triangular outline.

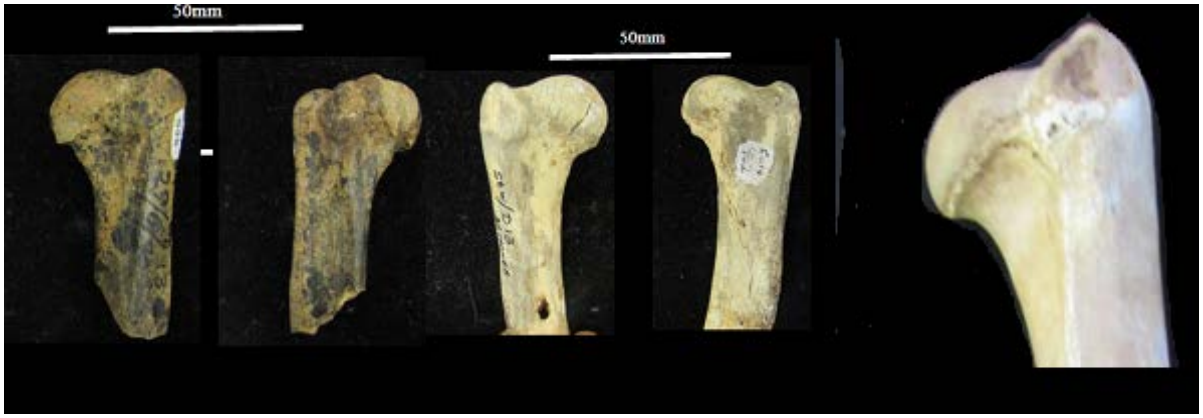


Figure 4.1. SWP 504, a right proximal humerus and SWP 962, a left proximal humerus and BPI/C/541, a modern *Papio ursinus* humerus.


Figure 4.2. From left to right, fossil specimens SWP 1141(*Papio*/*Parapapio*), SWP 1271 (*Papio*/*Parapapio*), BPI/C/541 (modern *Papio* sp), UCMP 125868 (*Papio izodi*), UCMP 56693 (*Procercocebus antiquus*/*Parapapio*), SWP 1262 (*Parapapio*), SWP 1137 (*Parapapio*) and KNM-ER 30298 (cf. *Parapapio*). Note that *Parapapio* specimens have a high triangular olecranon fossa, compared to the four specimens on the left with more elongated ellipsoid olecranon fossae. Data and images derived from Gilbert *et al*. 2016 and Jablonski *et al*. (2008).

b) Ulna

Two proximal ulnae within the Sterkfontein assemblage as assigned to *Parapapio*. These have the following morphology- 1) the centre of the olecranon process is retroflexed; 2) the anconeal process articular surface is in horizontal plane with some proximal extension; 3) on medial view, the anconeal process is a blunt beak which is extensive proximally and flattens out posteriorly 5) the trochlea notch shape is crescentic 6) the coronoid process articular surface is in horizontal plane with no significant distal extension 7) the shaft has a groove distal to the coronoid process and 8) a deep depression distal to the radial notch is present; 9) the shaft is nearly straight proximo-distally. Only a single *Parapapio* ulna specimen is known, specimen KNM-ER 30315 from Koobi Fora. Modern *Papio* ulnae are also used for comparison. Jablonski *et al.* 2008 indicate that the specimen is identical to *Papio*. They also state that this ulna has a deep olecranon, which based on my observation, is consistent with the deep olecranon fossa seen in the *Parapapio* humerus. The main difference that could be established between these and *Papio* specimens is the distinction of the anconeal process in medial view, which, in *Parapapio* specimens, is thick and reduced.

- BP/3/23257, a right proximal ulna which preserves less than a third of the shaft proximally:

  The centre of the olecranon process is retroflexed. The anconeal process articular surface is in horizontal plane with proximal extension. In medial view, the anconeal process is not as defined as in *Papio* sp ulnae. It rises into a steep angle antero-posteriorly and the posterior most portion is flat. The trochlea notch shape is crescentic. The coronoid process articular surface is in horizontal plane with no significant distal extension. The shaft groove distal to the coronoid process is present. The deep depression distal to the radial notch is present. The shaft is nearly straight proximo-distally.

- SWP 523, (Fig. 4.3) a right proximal ulna with more than half of the shaft preserved proximally:

This specimen's anterior anconeal process is broken off. The olecranon superior aspect is flattened. Its lateral aspect is higher than the medial. The olecranon superior projection is less than the trochlea notch. The shaft groove distal to the coronoid process is present but is cracked. The shaft is nearly straight.


Figure 4.3. On the left, the fossil SWP 523, a right *Parapapio sp.* proximal ulna and, on the right KNM-ER 30315 a left cf. *Parapapio* proximal ulna from Koobi Fora (Jablonski *et al*. 2008). Note that the beak of the olecranon is not as pronounced as observed in *Papio*.

Figure 4.4. BP/I/C/541, a modern *Papio ursinus* ulna. Note the pronounced olecranon beak on the *Papio* specimen and the continuous anconeal process which is not separated from the posterior olecranon on the fossil *Parapapio* specimen.

c) Radius

Six proximal radii reflect the following characteristics- 1) on superior view the head is ovoid; 2) it has a depression for accommodation of the capitulum; 3) the head lateral aspect lies lower than the medial aspect; 4) the neck is relatively longer than *Papio* sp neck; 5) the bicipital/radial tuberosity is a lateral bulge with a centrally located furrow. These characteristics are consistent with specimen EP142/04 from upper Laetoli beds in Laetoli, Tanzania (Harrison 2011). The radius head shape is similar to other papionins. It is ovoid. The most distinguishing feature is the relatively longer neck and the bicipital tuberosity which usually (but not always) preserves a central furrow. Variation on the presence of a furrow on the bicipital tuberosity is observed in this group of specimens. However the constant feature is the relative extension of the neck.

- SWP 515, a left proximal radius:
  The head shape on this specimen is ovoid with a defined rim. In superior view it has a deep depression for insertion of the capitulum, more so than in *Papio* specimens. The neck is relatively longer. There is a proximo-distally elongated bicipital tuberosity which bears a longitudinal furrow located in its centre. The lateral aspect of the head is lower than the medial aspect. The specimen has the longest neck of all cercopithecoid radii in the Sterkfontein. This is not a factor of size. The specimen is medium sized and similar in size to specimens within the assemblage.

- SWP 1204, a left proximal radius:
  The head is chipped off on the medial anterior side. The head is ovoid in shape and its lateral aspect is lower than the medial. The bicipital tuberosity has a centrally located longitudinal furrow.

- SWP 1219, a left proximal radius:
  The shape of the head is nearly round and has a depression in superior view. The lateral aspect of the head is on the same level as the medial aspect. The bicipital tuberosity is elongated proximo-distally and bears a longitudinal furrow in its centre.

- SWP 784, a right proximal radius:

  The specimen's head is broken on the posterior dimension. Only the anterior head and proximal portion of the shaft preserved. The medial edge of the head is higher than the lateral aspect. The bicipital tuberosity does not bear a longitudinal furrow.

- SWP 802, a right proximal radius:

  The head shape is ovoid and the lateral aspect is inferior to the medial aspect. The bicipital tuberosity bears a longitudinal furrow.

- SWP 4243, a right proximal radius with more than a third of the shaft preserved proximally:

  The head is ovoid. On superior view the head is depressed. The head's lateral aspect lies lower than the medial aspect. The bicipital tuberosity bears a furrow centrally and does not have the extreme lateral projection seen in *Papio*. The neck is relatively long. The shaft is nearly straight.


Figure 4.5. Top left insert, specimen EP 142/04, a *Parapapio ado* radius from Laetoli (After Harrison 2011). On the right, SWP 4243, a *Parapapi*o radius and BPI/C 541, a modern *Papio* radius. Note the shallow furrow on the centre of the fossil specimen

d) Femur

One femur is described as *Parapapio* sp.

- SWP 1300, a left proximal femur with more than a third of the shaft preserved proximally:

  The greater trochanter on this specimen extends superior to the head 1) and points medially. 2) The lateral surface area of the greater trochanter is flat. 3) The intertrochnateric fossa is deep and lies at the same level as the head. 4) The lesser trochnater faces medially. This femur specimen resembles AL 363 from Hadar, Ethiopia (Frost & Delson 2002).

*Locomotor adaptation of specimens identified as <u>Parapapio</u>* sp

The Sterkfontein *Parapapio* specimens demonstrate morphology that is consistent with semi-terrestrial locomotion. The upper humerus with a greater tuberosity that lies below the head points to a shoulder joint with rotary capabilities (Harrison 1989). The distal humerus (with a retroflexed medial epicondyle, the trochlea medial lip which is distally projecting) bears features consistent with terrestrially adapted motion. Retroflexion of the humeral medial epicondyle assists in stabilization of the elbow joint (Jolly 1972). The proximal radius has not been proved to have locomotor or behavioural differences; however, the relatively elongated radial neck is generally observed in colobines and cercopithecins (Harrison 2011). Therefore it is a trait usually associated with arborealy and semi-terrestrially adapted monkeys. The proximal ulna and the only femur identified both preserve characteristics consistent with an adaptation to terrestrial substrates.

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | *Papio.* Eerxleben, 1777 |

a) Humerus

Seventeen humeri reflect *Papio* sp characteristics. They possess the following traits- 1) a hemi-spherical head shape; 2) the head and the lesser tuberosity are continuous; 3) the greater tuberosity is significantly larger than the lesser tuberosity; 4) the greater tuberosity superior extension lies above the level of humeral head; 5) the greater tuberosity has a slightly convex lateral surface area; 6) the tuberosities are separated by a narrow groove; 7) the shaft is nearly straight; distally, 8) the shaft is thick and rounded in coronal plane; 9) the medial epicondyle is retroflexed 10) the lateral epicondyle is smaller than the medial epicondyle; 11) the trochlea distal lip is short; 12) the trochlea is medially inclined relative to the humeral shaft; 13) the trochlea breadth is narrow 14) in the proximo-distal axis, the capitulum's medio-lateral width is distally narrowed 15) the olecranon fossa is shallow and nearly rounded or elongated-ellipsoid. These bear similarities to specimen UCMP 125868, a *Papio izodi* humerus identified from Taung by Gilbert *et al*. (2016).

- BP/3/22757 is a head with a greater tuberosity with less than a third of the proximal shaft preserved:

  The head is proximo-distally compressed. The head and the lesser tuberosity are continuous. The greater tuberosity is significantly larger than the lesser tuberosity and its superior extension lies above the level of humeral head. Its lateral surface area is slightly convex.

- SWP 960, a proximal humerus:

  The specimen's head is proximo-distally compressed. The head and the lesser tuberosity are continuous. The greater tuberosity is significantly larger than the lesser tuberosity. Its superior extension lies above the level of the humeral head.

- SWP 1201, a head with the lesser and greater tuberosities:
  The head has a hemi-spherical shape. The head and the lesser tuberosity are continuous. The greater tuberosity is significantly larger than the lesser tuberosity and its superior extension lies above the level of humeral head. The greater tuberosity's lateral surface area is slightly convex. This specimen is abraded on the medial and lateral aspect of the intertubercular groove, such that this morphology cannot be ascertained on this particular specimen.

- SWP 830, a right proximal humerus fragment:
  The specimen preserves less than a third of the shaft proximally and is part of a cluster of fore-limb specimens embedded in a breccia block. The head shape is hemi-spherical. The greater tuberosity lies above the level of the head.

- S94-10064, a right proximal humerus head:
  The head has a hemispherical shape. The greater tuberosity is chipped off proximally. However, it is sufficiently preserved to determine that its superior extension is significantly larger than the lesser tuberosity.

- SWP 1276, a right proximal humerus:
  This specimen is chipped proximo-medially but the head shape is discernable is nearly round. The greater tuberosity is significantly greater than the lesser. The greater tuberosity is chipped off proximally and has a slightly convex lateral surface area. The intertubercular groove/sulcus is deep with sharply defined lateral and medial margins.

- SWP 1406, a right proximal humerus:
  The specimen's greater tuberosity is broken off in the proximo-distal plane. The greater tuberosity lies significantly above the head. The bicipital groove is shallow.

- SWP 2385, a right proximal humerus:
  The head shape is hemispherical; it is proximo-distally compressed. The head and lesser tuberosity are continuous. The greater tuberosity is significantly greater than the

lesser tuberosity. The intertubercular groove is deep with sharply defined lateral and medial margins.

Figure 4.6. A modern left *Papio ursinus* humerus and, on the right, SWP 2385, a right *Papio* sp proximal humerus.

- BP/3/23389, a left distal humerus:

  The humeral shaft shape is approximately straight. The medial epicondyle is retroflexed and is wider than the lateral epicondyle which is slightly covered in breccia. The trochlea is medially inclined relative to the humeral shaft. The trochlea breadth is narrow. In the proximo-distal axis, the capitulum's medio-lateral width is distally narrowed. Similar to other specimens in this category, the olecranon fossa is rounded ellipsoid.

- SWP 511, a left distal humerus:

  This specimen's distal shaft morphology is asymmetrical, thick and rounded. The medial epicondyle is approximately equal in size to the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow. Its medial lip distal projection is short. The capitulum's medio-lateral width is even in the proximo-distal axis. The olecranon fossa shape is elongated-ellipsoid.

- SWP 1176, a left distal humerus:

SWP 1176 has a thick and rounded distal shaft. The medial and lateral edges are oriented asymmetrically. The medial epicondyle is approximately equal to the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea projects distally. It has a narrow breadth with a distal projection of the medial lip which is short and medially inclined relative to shaft. The capitulum's medio-lateral width is even in the proximo-distal axis. The olecranon fossa is elongated-ellipsoid.

- SWP 2810, a left distal humerus:
  This is one of the medium sized specimens within the Sterkfontein assemblage. The distal shaft's medial and lateral edges are oriented asymmetrically. The distal shaft is thick and rounded. The medial epicondyle is approximately equal to the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face and projects minimally above the level of the olecranon fossa. The trochlea breadth is broken off. The capitulum's medio-lateral width is even in the proximo-distal axis. The olecranon fossa is elongated-ellipsoid.

Right distal humeri

- BP/3/31691, a right distal humerus with less than a third of the shaft preserved distally:
  The distal shaft on this specimen is relatively straight and thick and rounded. The medial epicondyle is wider than the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow; its medial distal lip projection is short and medially inclined relative to the humeral shaft. In the proximo-distal axis, the capitulum has a narrowed medio-lateral width distally. The olecranon fossa is deep and elongated-ellipsoid.

- SWP 911, a right distal humerus:
  This specimen's distal shaft's medial and lateral edges are oriented asymmetrically. The distal shaft is thick and rounded. The supinator crest is sharply raised and is approximately a third of the humeral shaft length. The medial epicondyle is approximately equal to the lateral epicondyle and is retroflexed. The lateral epicondyle

has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and is medially inclined relative to shaft. The medio-lateral breadth of the capitulum is even on the proximo-distal axis. The olecranon fossa has an elongated-ellipsoid shape.

- SWP 1120, a right distal humerus:
  This specimen has no epicondyles preserved; therefore no bi-epicondylar breadth is recorded. The olecranon fossa is elongated-ellipsoid and perforated. Some *Papio* species preserve an elongated-ellipsoid olecranon fossa or a rounded one and in others it is perforated.

- SWP 1584, a right distal humerus:
  This specimen is covered in breccia and the bone surface is highly flaked. It is one of the larger *Papio* humerus specimens in the Sterkfontein assemblage. The humeral distal shaft is thick and rounded; the medial and lateral edges are asymmetrical. The medial epicondyle is narrower than the lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing olecranon fossa. The trochlea breadth is narrow. The trochlea medial distal lip and capitulum are broken off distally. The olecranon fossa is elongated-ellipsoid in shape; it is wider medio-laterally.

- SWP 4246, a right distal humerus:
  The olecranon fossa is elongated-ellipsoid. The trochlea breadth is narrow. The lateral epicondyle morphology has a small dorsal face with minimal projection above the level of the olecranon fossa. The medial epicondyle is retroflexed and is wider than lateral epicondyle. The distal shaft is thick and rounded. The medio-lateral breadth of the capitulum is narrowed distally in the proximo-distal axis.

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b) Ulna

Nine proximal ulnae are attributed to *Papio* sp. These have 1) an anconeal process which is in horizontal plane with no significant proximal extension; 2) the coronoid process is also in

horizontal plane with no significant distal extension; 3) the trochlea notch has a crescentic shape; 4) the olecranon is less than the trochlea notch length; 5) the centre of the olecranon process is retroflexed 6) in medial view, the anconeal process is flattened in the antero-posterior dimension; 8) and the posterior portion of the olecranon process rises sharply. All eight proximal ulnae demonstrate this feature. These vary from *Parapapio* by having a defined beak (in the medial and lateral views) of the anconeal process.

- SWP 1208, a left proximal ulna with less than a third of the shaft preserved proximally:
  The ulna is very slender, medio-laterally flattened and elongated more than other ulnae in the assemblage. The olecranon superior aspect morphology is flat with lateral and medial edges at approximately equal heights. The olecranon in colobines is short and straight (Jablonski & Leakey 2008). Its projection is less than the trochlea notch. A short olecranon indicates mechanical advantage for the *m. triceps brachii* muscles, a feature observed in arboreal cercopithecoids (*ibid.*). The centre of the process is aligned with the long axis of the ulna. The trochlea notch is shallow and does not bear a waist. It has a crescentic shape. The coronoid process' articular surface is in horizontal plane with no significant distal extension. The anconeal process is also in horizontal plane and quite small compared to other ulnae in the assemblage. The shaft groove distal to the coronoid process is present but relatively smaller than that observed in Papionins. Preservation of the shaft is not sufficient to determine the shaft shape.

- SWP 814, a right proximal ulna:
  The posterior portion of the olecranon process is broken off. The anconeal process is in horizontal plane with no significant proximal extension. The coronoid process is also in horizontal plane with no significant distal extension. The trochlea notch has a crescentic shape. The olecranon is less than the trochlea notch length. The centre of the olecranon process is retroflexed. In medial view, the anconeal process is sharply projecting dorsally; it is flattened in the antero-posterior dimension.

- SWP 830, a right proximal ulna fragment:
  This specimen is part of an upper arm preserved in a breccia block. The olecranon is retroflexed. Its superior extension is less than the trochlea notch length. The anconeal process is in horizontal plane with no significant proximal extension. The coronoid

process is also in horizontal plane with no significant distal extension. The trochlea notch is crescentic in shape.

- SWP 1572, a right proximal ulna which preserves less than a third of the shaft proximally:
  The olecranon process is only partly preserved on the medial side and its whole posterior aspect is chipped off. The olecranon is retroflexed. The trochlea height is more than the olecranon superior projection. The depression below the radial notch is present.

- BP/3/23257, a right proximal ulna:
  The olecranon is retroflexed. Its medial and lateral aspects are unequal in height. The olecranon superior projection is less than the trochlea height. The coronoid process is in horizontal plane with no significant distal extension.

- SWP 824, a right proximal ulna without a shaft:
  The specimen's olecranon process is retroflexed.. The proximal extension of the olecranon is less than the trochlea notch. The coronoid process lies in horizontal plane with no significant distal extension.

- SWP 2788, a right proximal ulna without a shaft:
  The ulna has a retroflexed olecranon process with a spherical trochlear notch. Proximally, the olecranon medial and lateral edges are unequal in height; the lateral aspect is higher than the medial aspect.

- SWP 1155, a left proximal ulna without a shaft:
  This specimen is fragmented on the proximal olecranon. The coronoid process is in horizontal plane with no significant distal extension.

- SWP 1577, a left proximal ulna:
  The olecranon process is broken off proximally. The anconeal process is abraded but is in horizontal plane with no significant proximal extension. The trochlea notch is crescentic. The coronoid process is also in horizontal plane with no significant distal

extension. The ulna shaft groove disto-medial to coronoid process is present. The deep depression distal to the radial notch is present.

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c) Radius.

Fifteen radii are identified as *Papio* sp. These demonstrate the following features- 1) the head superior view is ovoid and slightly depressed; 2) the head lateral aspect lies lower than the medial aspect 3) the bicipital tuberosity is a proximo-distal protrusion which does not bear a central groove 4) the neck is also relatively shorter, compared to *Parapapio* sp 5) the radial shaft in is superiorly dorso-ventrally flattened and approximately straight.

- BP/3/23235, a left proximal radius:

  In superior view, the radius head is ovoid and slightly depressed. Its medial and lateral borders are slightly unequal in height. The bicipital tuberosity is bulbous and elongated proximo-distally, suggesting a large insertion for *m. biceps brachii*. In lateral view, it extends out of the shaft and has a longitudinal groove laterally which is not centrally located as observed in *Parapapio* sp. The bicipital tuberosity is mainly rugose rather than having a furrow run through it centrally. The neck is also relatively shorter, compared to *Parapapio* sp. The radial shaft in is superiorly dorso-ventrally flattened and approximately straight.

- BP/3/31923, a left small proximal radius :

  This specimen belongs to a small juvenile and the head is therefore missing. The bicipital tuberosity is bulbous and elongated proximo-distally. In lateral view, it extends out of the shaft and has a laterally projecting bicipital tuberosity. The neck is short. The radial shaft and neck are superiorly dorso-ventrally flattened and the shaft almost straight.

- BP/3/23453, a right proximal radius with more than a third of the shaft preserved proximally:

The head shape is ovoid. The lateral aspect of the head lies inferior to the medial aspect. The bicipital tuberosity is elongated with a lateral projection.

- SWP 514, a right proximal radius with more than a third of the shaft preserved proximally:
  The shape of the head is ovoid. The lateral aspect lies inferior to the medial aspect. In superior view it bears a slight depression. The bicipital tuberosity is wider than the body in medial view and has no ridges.

- SWP 793, a right proximal radius:
  The head shape is slightly medio-laterally compressed. The head is tilted laterally. The bicipital tuberosity is wide medio-laterally but still elongated. It bears a longitudinal furrow and has a deep ridge antero-medially.

- SWP 4022, a left proximal radius:
  The shape of the head is ovoid. The lateral aspect lies inferior to the medial aspect. In superior view it bears a slight depression. The neck is short. The bicipital tuberosity protrudes laterally and bears no furrow.


Figure 4.7. SWP 4022, a fossil *Papio* radius specimen and BPI/C/541, a modern *Papio ursinus* radius.


Figure 4.8. BP/3/31923, a fossil *Papio* radius and BPI/C/541, a modern *Papio* ursinus radius.

- SWP 803, a right proximal radius

  In superior view, the head has an ovoid shape. It also bears a slight depression for accommodation of the capitulum. The lateral aspect of the head is lower than the medial aspect. The neck is relatively long; it is one of the longest necks in the assemblage. The bicipital tuberosity is elongated proximo-distally and has an elongated furrow on its antero-medial side.

- SWP 1418, a right proximal radius:

  This specimen's head has a nearly round shape. The head lateral aspect lies inferior to the medial aspect. The neck is relatively short. The bicipital tuberosity is proximo-distally elongated and bulbous.

- SWP 1552, a right proximal radius:

  This radial head shape is ovoid. The head's lateral aspect is lower than the medial. The bicipital tuberosity bears a longitudinal furrow on the medial side.

- SWP 2200 is a right proximal radius with the neck and bicipital tuberosity:

  The head shape is ovoid. The bicipital groove is fractured, however it is bulbous with a strong lateral projection.

- SWP 798, a right proximal radius:

  The radial head is chewed off on the whole anterior aspect of this specimen; however, the head is ovoid and is depressed in superior view. The lateral aspect is on the same level as the medial aspect. The bicipital tuberosity is wider than the body medio-laterally, and does not have a furrow centrally. It only has a depression on its anterior side.

- SWP 4042, a left proximal radius:

  This specimen preserves the same features as seen in other specimens. It has an ovoid head. In superior view the head has a shallow depression. The lateral aspect is lower than the medial aspect. The neck is short. The bicipital tuberosity has a lateral bulge and does not preserve a furrow in its centre.

- SWP 517, a left proximal radius with less than a third of the shaft preserved proximally:
  The head shape is ovoid. The lateral aspect lies at the same level as the medial aspect. The bicipital tuberosity is elongated proximo-distally and bears a longitudinal furrow and extends out of the body. Behind it antero-medially is a ridge with a sharp crest.

- SWP 791, a left proximal radius with less than a third of the shaft preserved proximally:
  The head is rounded to ovoid and is depressed in superior view. The neck is short. The bicipital tuberosity has an extreme lateral projection.

- SWP 4249, a left proximal radius with less than a third of the shaft preserved proximally:
  The radial head superior view has a slight depression. The neck is short, and, it is oval on the dorso-ventral plane. The bicipital tuberosity has an extensive lateral protrusion.

The differences between the femur of *Parapapio* sp and *Papio* sp are not established in this research. As a result, all femora are assigned to the *Papio*/*Papio* sp category.

*Locomotor adaptation of specimens identified as Papio* sp

Skeletal elements identified as *Papio* sp preserve morphology consistent with terrestrial adaptation. The humerus, which is the most occurring specimen in the assemblage points to a cercopithecoid adapted to terrestrial locomotion. Proximally, it has a greater tuberosity which extends above the level of the head; distally it preserves characters linked to restricted quadrupedal activities such as a deep olecranon fossa and a short retroflexed medial epicondyle and distally projecting trochlea lip (Youlatos & Meldrum 2011). The ulna specimen possesses a retroflexed olecranon, a feature common in papionins. The radius head is very similar to the semi-terrestrial *Parapapio* but the radial the neck is relatively shorter compared to what is observed in arboreal monkeys.

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | *Papio*/*Parapapio* sp. |

The Sterkfontein fossil cercopithecoid postcranial assemblage consists of specimens which, due to ambiguous character states and or fragmentation of defining morphology, cannot be confidently assigned to either group. The most defining features in the humerus of the two groups (*Parapapio* sp and *Papio* sp), the projection of the greater tuberosity and the shape of the olecranon, are ambiguous and cannot be clearly distinguished and assigned to either group. The main ulna feature which could not be determined to separate the specimens between the two genera is the dorso-ventral elevation of the olecranon superior aspect. The specimens classed into this group do not preserve sufficient morphology to determine the olecranon superior structure. On the radius, the relative size of the neck and the central furrow on the bicipital tuberosity which are used to distinguish between *Papio* and *Parapapio* could not be differentiated and, as a result, radii which do not preserve sufficient morphology to discriminate between these are lumped into the *Papio*/*Parapapio* group. There is no sufficient evidence of *Parapapio* femur in the literature to differentiate this genus from *Papio*. Specimen AL 363-1c, a proximal femur specimen from Hadar in Ethiopia (Frost & Delson 2002), assigned to *Parapapio jonesi* could not be contrasted to *Papio* specimens.

a) Humerus

Humeri which bear the combination of *Parapapio* and *Papio* sp features and are too fragmented to assign to genus are lumped in the *Papio*/*Papio* sp category. These specimens bear features which are consistent with both *Parapapio* sp and *Papio* sp morphology: 1) the proximal humerus has a globular head: 2) the tuberosity sizes are relatively similar and in some specimens the greater tuberosity is larger than the lesser tuberosity: 3) the greater tuberosity lies at the same level as the head; 4) the distal shaft is asymmetrical in the dorso-ventral plane; 5) the dorsal pillars are wider and thicker above the lateral epicondyle; 6) distally the olecranon fossa is deep and rounded-ellipsoid. These specimens do not display

the same robust masculinity observed in *Theropithecus* specimens. Twenty-nine humeri specimens are discussed.

- ST (number is invisible), a left proximal humerus head:
  The humeral head shape on this specimen is proximo-distally compressed as seen in *Papio*nins. The head and lesser tuberosity are continuous. The greater tuberosity is significantly larger than the lesser tuberosity

- SWP 2792, a right proximal humerus:
  The humeral head shape on this specimen is proximo-distally compressed as seen in *Papio*nins. The head and lesser tuberosity are continuous. The greater tuberosity is significantly larger than the lesser tuberosity. The humeral head and lesser tuberosity are at the same level. The sizes of the trochantae and the proximal extension of the greater trochantae have a combination of features which can either be part of *Parapapio* sp (which preserves a greater tuberosity which lies at same level as the head) or *Papio* sp (which has trochantae of unequal size). The greater tuberosity surface is slightly convex.

- BP/3/24000 , a left distal humerus:
  This specimen preserves a distal shaft which is nearly straight. It is thick and rounded on its most distal end. The distal shaft's medial and lateral edges are asymmetrical. The distal shaft dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is retroflexed. The lateral epicondyle has a small dorsal face with minimal projection above the level of the olecranon fossa. The trochlea is broken off. The capitulum medio-lateral width is distally narrowed in the proximo-distal axis. This specimen preserves a rounded ellipsoid olecranon fossa.

- BP/3/18382, a left distal humerus:
  This specimen's medial epicondyle is approximately the same size as the lateral epicondyle. The medial epicondyle is retroflexed. The lateral epicondyle has a small dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow with a medial lip distal projection is short and medially inclined. In the proximo-distal

axis, the capitulum medio-lateral width is distally narrowed. The olecranon fossa is deep and is nearly rounded.

- BP/3/23016 left distal humerus condyles:

  The specimen is similar to others in this class. It is medium in size. The medial epicondyle is wider than the lateral epicondyle. The medial epicondyle is retroflexed. The trochlea breadth is narrow. The trochlea medial lip distal projection is short, and is medially inclined. The capitulums' width is medio-laterally even when viewed in the proximo-distal axis. The full olecranon shape cannot be determined as it is missing its proximal portion.

- STS 1504, a left distal humerus:

  This specimen is largely covered in matrix. Only the trochlea and capitulum are visible. The trochlea is short and medially inclined. It has a narrow breadth. The capitulum has an even medio-lateral width in the proximo-distal axis.

- SWP 510, a left distal humerus:

  SWP 510's medial epicondyle is approximately equal in size to the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to the shaft. The capitulum's medio-lateral width is even in the proximo-distal axis. The olecranon fossa is rounded ellipsoid.


Figure 4.9. SWP 2792, a right proximal humerus demonstrating the head and the greater tuberosity which lie on the same level.

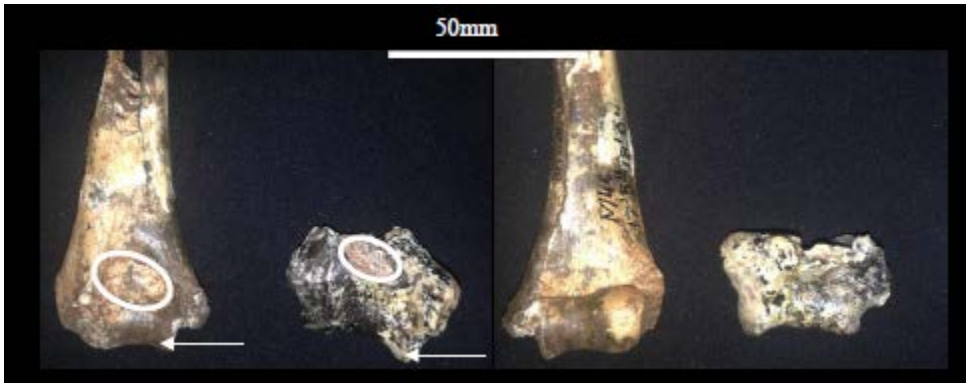


Figure 4.10. Left to right, BP/3/24000 (a left distal humerus) and BP/3/23016 (left distal humerus) demonstrating the elongated-ellipsoid shape of the olecranon fossa and a trochlea distal projection which is medially inclined.

- SWP 562, a left humerus without the head:

  This specimen is one of the larger specimens in this class. It preserves the whole shaft and distal humerus and is only missing the head. The shaft is approximately straight. The medial and lateral edges are asymmetrical. The distal shaft is thick and rounded. The distal shaft dorsal pillars are asymmetrical and rounded above the lateral and medial edges. The supinator crest is sharply raised and approximately a third of the humeral shaft length. The medial epicondyle is retroflexed and approximately equal in size to the lateral epicondyle. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to the shaft. The capitulum is broken off distally. The olecranon fossa shape is rounded ellipsoid.

- SWP 995, a left distal humerus with more than a third of the shaft preserved:

  The humeral shaft is approximately straight. The medial and lateral edges are asymmetrical. The distal shaft is thick and rounded above the lateral and medial epicondyles. The medial epicondyle is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and missing the distal portion. The capitulum's medio-lateral width is even in the proximo-distal axis. The olecranon fossa is rounded.

- SWP 1410, a left distal humerus:

  This specimen has a thick and rounded distal shaft. The distal dorsal shaft pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is narrower than the lateral epicondyle. The medial epicondyle is retroflexed while the lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to the humeral shaft. Viewed in the proximo-distal axis, the capitulum's medio-lateral width is distally narrowed. The olecranon fossa is elongated-ellipsoid.

- SWP 4019, a right distal humerus:

  Distally, the shaft is thick and rounded. It is asymmetrical in dorso-ventral view. The distal dorsal shaft pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is narrower than the lateral epicondyle. The medial epicondyle is retroflexed while the lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to the humeral shaft. Viewed in the proximo-distal axis, the capitulum's medio-lateral width is distally narrowed. The olecranon fossa is elongated-ellipsoid.

- SWP 4038, a left distal humerus:

  The medial and lateral edges are oriented asymmetrically. Distally, the shaft is rounded. The distal shaft dorsal pillars are wider and thicker above lateral epicondyle. The shaft is broken but the supinator crest is sharply raised and a third of humeral shaft length. The medial epicondyle is narrower than lateral epicondyle and is retroflexed. The lateral epicondyle has a large dorsal face with tall wall facing the olecranon fossa. The trochlea breadth is narrow. Trochlea medial lip distal projection is short and medially inclined. The capitulum's medio-lateral width is distally narrower when viewed in the proximo-distal plane. The olecranon fossa shape cannot be ascertained, as it is covered with breccia.

- SWP 4041, a left distal humerus:

  This specimen's distal shaft is thick and rounded. The medial and lateral edges are oriented asymmetrically. The distal shaft dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyles are narrower than lateral epicondyle and are retroflexed. The trochlea breadth is narrow and its medial lip distal projection is long and perpendicular to humeral shaft. The medio-lateral breadth of the capitulum is narrowed distally on the proximo-distal axis. The olecranon fossa is elongated-ellipsoid.

- SWP 1199, a right proximal humerus:

  The head shape on this specimen is nearly round. The greater tuberosity is broken off proximally and is slightly larger than the lesser tuberosity. Therefore its length relative to the head is indeterminate. The intertubercular groove is deep with sharply defined medial and lateral margins.

- SWP 1542, a right proximal humerus:

  This specimen preserves a greater tuberosity and a head which is broken medially. The whole specimen is broken on its posterior side. No shaft is on preserved. The head and greater tuberosity are continuous.

- BP/3/24053, a right, highly fragmented distal humerus:

  The lateral portion of the specimen is missing. The medio-lateral breadth of the capitulum is narrowed distally. The medio-lateral breadth of the capitulum is even in the proximo-distal axis. The medial epicondyle is narrower than the lateral epicondyle. The medial epicondyle is retroflexed.

- SWP 4239, a right distal humerus:

  The specimen is highly flaked . It preserves more than half of the shaft distally. The distal shaft is rounded and its shaft dorsal pillars are thick and rounded above the lateral epicondyle. The medial and lateral epicondyles are roughly equal in size. The trochlea breadth is narrow and its medial lip distal projection is perpendicular to the shaft. In proximo-inferior view, the medio-lateral breadth of the capitulum is narrowed distally. The olecranon fossa has a rounded-ellipsoid shape.

- SWP 507, a right distal humerus:

  The distal shaft's medial and lateral edges are asymmetrically oriented. The distal shaft is rounded. The medial epicondyle is approximately equal to the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the olecranon fossa. The trochlea is narrow. Its medial lip distal projection is short and medially inclined relative to the shaft. In the proximo-distal axis, the capitulum's medio-lateral width is distally narrowed. The olecranon is perforated and is almost rounded.

- STS 377c, a right distal humerus:

  The specimen distal shaft is dorso-ventrally asymmetrical. The distal shaft is rounded and its shaft dorsal pillars are thick and rounded above the lateral epicondyle. The medial and lateral epicondyles are roughly equal in size. The trochlea breadth is narrow and its medial lip distal projection is perpendicular to the shaft. In the proximo-distal axis, the medio-lateral breadth of the capitulum is narrowed distally. The olecranon fossa has a rounded-ellipsoid shape.

- SWP 912, a right distal humerus:

  This specimen medial epicondyle is approximately equal to the lateral epicondyle and is dorsally inclined (retroflexed). The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and is medially inclined relative to shaft. The medio-lateral breadth of the capitulum is even on the proximo-distal axis. The olecranon fossa shape is rounded-ellipsoid.

- SWP 1016, a right distal humerus:

  This specimen's shaft is approximately straight. The medial and lateral edges are asymmetrical. The distal shaft is thick and rounded. The medial epicondyle is broken off. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial distal lip projection is short and medially inclined relative to the shaft. The capitulum is broken

off medially and therefore its width is not discernable. The olecranon fossa shape is rounded-ellipsoid.

- SWP 1140, a right distal humerus:
  This specimen is the largest humerus in this category. The medial and lateral edges of this specimen's distal shaft are asymmetrical. The medial epicondyle is approximately equal in width as the lateral epicondyle and is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to humeral shaft. In the proximo-inferior view, the medio-lateral breadth of the capitulum is narrowed distally. The olecranon fossa is shallow and elongated-ellipsoid.

- SWP 1141, a right distal humerus:
  This specimen is glued together which extends its length; therefore no reliable measurements could be derived from this specimen. The medial and lateral edges are oriented asymmetrically. The distal shaft is thick and rounded. The supinator crest is broken off. The epicondyles are also chipped off on this specimen. The trochlea breadth is narrow and its medial lip distal projection is short and medially inclined relative to shaft. The capitulum distal end is missing. The olecranon fossa shape is rounded-ellipsoid.

- SWP 1205, a right distal humerus:
  This specimen's shaft is approximately straight. The medial and lateral edges are symmetrical. The distal shaft is thick and rounded, and wider and thicker above the lateral epicondyle. The medial epicondyle is retroflexed. The lateral epicondyle has a small dorsal face with minimum projection above the level of the olecranon fossa. The trochlea breadth is narrow and its medial distal lip projection is short and medially inclined relative to the shaft. The medio-lateral width of the capitulum is even in the proximo-distal axis. The olecranon fossa shape is rounded-ellipsoid.

- SWP 1582, a right distal humeral condyle:

Only the lateral epicondyle, the distal articular surface and the distal half of the olecranon fossa are preserved on this specimen. The trochlea breadth is narrow. The medial lip distal projection is long and medially inclined. The medio-lateral breadth of the capitulum is narrowed distally. The olecranon fossa has an elongated-ellipsoid shape.

- SWP 2816, right distal humeral condyles:
  This specimen only preserves the capitulum and the medial and lateral condyles, however, with features consistent with *Parapapio* sp and *Papio* sp morphology. In superior view, the medio-lateral breadth of the capitulum is narrowed distally. The medial epicondyle is narrower than the lateral epicondyle and is retroflexed.

Unsided humeri

- STS 377D, a distal humerus fragment:
  This specimen is in a very flaky condition and is embedded in breccia. The olecranon fossa shape is elongated-ellipsoid. The distal shaft is rounded and asymmetrical. It is also thicker and wider above the lateral epicondyle.

- SWP 1119 is an unsided distal humerus fragment without a shaft:
  The specimen's distal shaft medial and lateral edges are oriented asymmetrically. The distal shaft is also thick and rounded with dorsal pillars which are wider and thicker above the lateral epicondyle. The medial epicondyle is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the olecranon fossa. The trochlea is narrow. The trochlea medial lip's distal projection is medially inclined relative to the humeral shaft. The capitulum's medio-lateral width is even in the proximo-distal axis. The olecranon fossa is rounded-ellipsoid in shape.

- SWP 2537, a distal humerus:
  The distal shaft medial and lateral edges are oriented asymmetrically. The distal shaft is also thick and rounded and its dorsal pillars are wider and thicker above the lateral epicondyle. The medial epicondyle is wider than the lateral epicondyle, and is retroflexed. The lateral epicondyle has a large dorsal face with a tall wall facing the

olecranon fossa. The olecranon fossa is filled with breccias and its shape cannot be determined. The capitulum has an even medio-lateral width in the proximo-distal axis.

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b) Ulna

Due to the fragmented state of preservation of the ulna sample resulting in some of the diagnostic anatomical parts as missing, some ulnae cannot be positively distinguished between *Parapapio* sp and *Papio* sp. The main feature which could not be determined to separate the specimens between the two genera is the dorso-ventral elevation of the olecranon superior aspect. These specimens do not preserve sufficient morphology to determine the olecranon superior structure. However, they preserve the following traits 1)the olecranon superior extension is less than the trochlea length; 2) the trochlea has a crescentic shape; 3) the coronoid process lies in horizontal plane without significant distal extension; 4) the radial notch is rounded to accommodate an ovoid radial head; and 5) they are not robust as seen in *Theropithecus sp* specimens. Fifteen proximal ulnae are included within the *Papio*/*Papio* sp category. No distal ulnae are identified within this group.

- BP/3/23271, a left proximal ulna:
- The olecranon superior aspect morphology is concave with the lateral aspect higher than the medial aspect. The olecranon superior projection is less than the trochlea notch length. The olecranon is retroflexed. The anconeal process is in coronal plane with no significant proximal extension. The trochlea notch is crescentic. The coronoid process articular surface is in horizontal plane with no significant distal extension. There shaft groove distal to the coronoid process is present.

- BP/3/23336, a left proximal ulna:

  This specimen is fully preserved proximally and is missing the shaft. The olecranon superior aspect morphology is concave with the lateral aspect higher than the medial aspect. The olecranon superior projection is less than the trochlea notch length. The olecranon is retroflexed. The anconeal process is broken off. The trochlea notch is

crescentic. The coronoid process articular surface is in horizontal plane with no significant distal extension. There is a shaft groove distal to the coronoid process.

- SWP 1569, a left proximal ulna:
  The superior olecranon on this specimen is broken off. The coronoid process is in horizontal plane with no significant distal extension.

- SWP 4008, a left proximal ulna with more than a third of the shaft preserved proximally:
  The superior aspect of the olecranon is broken off. The trochlea notch is crescent shaped. There is an elongated proximo-distal groove distal to the coronoid process. The coronoid process is extensive and extends medially creating a depression postero-medially to it. The depression below the radial notch is present with pillars on both the medial and lateral sides with the lateral pillar creating a poximo-distal ridge. The shaft shape is nearly straight.

- BP/3/23357, a right proximal ulna with less than a third of the proximal shaft preserved:
  The olecranon superior aspect is concave and inclined with the lateral aspect higher than the medial aspect. The superior aspect is less than the trochlea notch length. The olecranon is retroflexed. The trochlea notch is crescentic. The coronoid process articular surface is in horizontal plane without significant distal extension. The anconeal process articular surface also lies in horizontal plane with no significant proximal extension. The ulna shaft groove distal to coronoid process is present and the shaft fracture starts immediately where the depression starts.

- SWP 524, a right proximal ulna with more than a third of the shaft preserved:
  The specimen is broken off on the posterior olecranon process. The olecranon superior length is less than the trochlea notch. The trochlea notch is crescentic in shape. The coronoid process articular surface is in horizontal plane with no significant distal extension. The anconeal process' articular surface is in horizontal plane with no significant proximal extension. The ulna shaft groove disto-medial to the coronoid

process is present. The shaft is not fully preserved, is nearly straight. The depression distal to the radial notch is present.

- SWP 853, a right proximal ulna with less than a third of the shaft preserved:
  The olecranon is broken off medially on this specimen. The centre of the process is retroflexed. The trochlea notch is crescentic. The coronoid process is broken off anteriorly but is in horizontal plane with no significant distal extension. The anconeal process is broken off posteriorly and is also in horizontal plane with no significant proximal extension. There is a deep proximo-distal ridge below the radial notch.

- SWP 1568, a right proximal ulna:
  The olecranon process is broken off. The trochlea notch is crescent shaped. There is an elongated proximo-distal groove distal to the coronoid process. The coronoid process is extensive and extends medially; it emphasises the postero-medial depression.

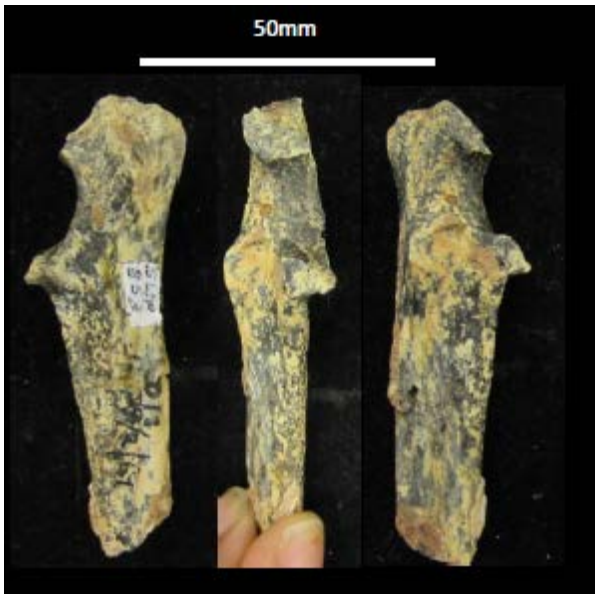


Figure 4.11. SWP 853 a right proximal ulna. The anconeal process is not fully preserved on this specimen.

- SWP 1570, a right proximal ulna:
  The olecranon is retroflexed. The superior aspect of the olecranon is smaller than the trochlea notch. The proximo-distal groove distal to the coronoid process is present. The coronoid process projects significantly medial to the rest of the ulna. The

depression below the radial notch is present with pillars on both the medial and lateral sides with the lateral pillar creating a poximo-distal ridge.

- SWP 1571: a right proximal ulna:
  The specimen's olecranon process is slightly broken off posteriorly. The olecranon is retroflexed. The superior aspect of the olecranon is very small, and much less than the trochlea notch. The proximo-distal groove distal to coronoid process is present. The coronoid process lies in horizontal plane with no significant distal extension.

- SWP 1576, a right proximal ulna:
  This specimen is missing the whole posterior aspect. The radial notch is rounded and has a depression distally.

- SWP 1580, a right proximal ulna:
  The olecranon on this specimen is missing the posterior superior portion. The superior aspect of the olecranon is less than the trochlea notch.

- SWP 1590, a right proximal ulna:
  The anconeal process is missing on this specimen. The superior aspect of the olecranon is, however, less than the trochlea notch.

- BP/3/31175, a right proximal ulna without shaft:
  This specimen's posterior portion of the olecranon process is broken off. The anconeal process lies in horizontal plane. The olecranon superior aspect is concave and the lateral aspect projects higher than the medial aspect. The remaining portion of the olecranon superior projection is less than the trochlea length. The coronoid process articular surface is in horizontal plane with no significant distal extension.

- SWP 2296, a right proximal ulna:
  The olecranon superior aspect is concave with the lateral aspect higher than medial. Its superior projection is less than the trochlea notch length. The olecranon is retroflexed. The trochlea notch is crescentic. The coronoid process articular surface is in horizontal plane without significant distal extension. The anconeal process articular surface also

lies in horizontal plane with no significant proximal extension. The ulna shaft groove distal to the coronoid process is present.

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c) Radius

Ambiguity of diagnostic traits and fragmentary nature of the specimens prevented assignment to either *Parapapio* sp or *Papio* sp. 1) the head is not as robust as observed in *Theropithecus* sp specimens; 2) the head is ovoid in shape and its medial and lateral aspects are unequal in height. In the absence of a well preserved bicipital tuberosity combined with either a long or short neck, it is difficult to discern between these two genera. Five of these radii are therefore included in the *Papio*/*Papio* sp category.

- BP/3/24043, a left proximal radius:
  This specimen's head is broken off on its dorsal and ventral portions. The head shape, however, is ovoid, unlike that which is observed in colobines. The bicipital tuberosity is also broken off ventrally and bears a longitudinal furrow in its centre.

- SWP 518, a left proximal radius:
  The head is depressed in superior view. It is ovoid in shape. The lateral and medial aspects are approximately on the same level.

- SWP 1368, a left proximal radius:
  The specimen has the head broken off on its anterior side and medial aspect. Therefore The only undisturbed morphology is the bicipital tuberosity with has a furrow on the medial side.

- SWP 1519, a right proximal radius:
  The head is broken off on the posterior aspect. The head shape is ovoid and is depressed in superior view. The neck is 8.16mm long in the proximo-distal axis. The bicipital tuberosity is elongated proximo-distally but does not preserve a furrow.

- SWP 2177, right proximal radius:

  A portion of the head is broken off on the posterior side. The head is ovoid and is depressed in superior view. The deep depression on the head could suggest that this specimen similar to *Parapapio* sp specimens; however the neck size is too short. The bicipital tuberosity is covered in breccia.

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d) Femur

There is no sufficient evidence of *Parapapio* femur in the literature to differentiate this genus from *Papio*. The main known *Parapapio* femur is specimen AL 363-1c, a proximal femur from Hadar in Ethiopia (Frost & Delson 2002). This specimen could not be contrasted to *Papio* specimens. It preserves the following features: it has a long neck, the head is not cranially oriented; the neck shaft angle overlies with many other species; the greater trochanter is elevated superiorly to the head and is medially; the lesser trochanter is also medially oriented; the fovea capitis is short and oval. The fossil femora specimens which are identified as part of the *Papio*/*Parapapio* group preserve the following characteristics: 1) the greater tuberosity extends above the head; 2) it is medially oriented and not as robust as in *Theropithecus* sp specimens; 2) its lateral surface is not as rugose and concave as that of *Theropithecus* sp specimens.3) the lesser trochanter is long with a parabolic profile and faces more medially than dorsally 4) The neck is short. The length of the neck is the only feature which could be of significance to differentiating between the two genera. However, because the neck shaft angle of the *Papio jonesi* (AL 363-1c) specimen overlaps many species, it cannot be used to isolate between the two. Seventeen proximal femora are assigned to *Papio*/*Papio* sp category.

- SF 5496 (Fig. 4.12), a left proximal femur with less than a third of the shaft preserved proximally:

  The head has a superior orientation. The fovea capitis is located centrally on the anterior head surface. The femoral head bears obvious dorsal extension towards the greater tuberosity. The greater trochanter has a blunt apex and is oriented superiorly. The intertrochanteric fossa shape is large and deeply cavitated. It is located at the same

level as the femoral head and is narrow with parallel margins. The lesser trochanter is long with a parabolic profile and faces more medially than dorsally. The neck is short.

- SWP 1404, a right proximal femur:
  The femur is slender. The greater trochanter is elevated above the level of the head. It is superiorly pointed. The greater trochanter lateral surface is almost flattened. Proximo-laterally, the *linear aspera* is sharp and creates a flange on the lateral side. The femur shaft is proximally asymmetrical. The lesser trochanter is reduced with a triangular profile and is medially facing. Its supero-medial face has a large flat facet for attachment of *m. psoas major*. The intertrochanteric fossa is small and deeply cavitated and is located at the same level as the head. The *fovea capitis* is oval and elongated dorso-ventrally. The intertrochanteric groove is relatively narrow with parallel margins.

- SWP 1700, a left proximal femur with most of the shaft preserved:
  The head of this specimen is fragmented. The greater trochanter is bluntly pointed and is superiorly oriented relative to the femoral head. The intertrochanteric fossa is small and deeply cavitated and lies at same level as the head. The intertrochanteric groove is relatively narrow with parallel margins. The lesser trochanter has a long base with a parabolic profile and faces more medially than dorsally.

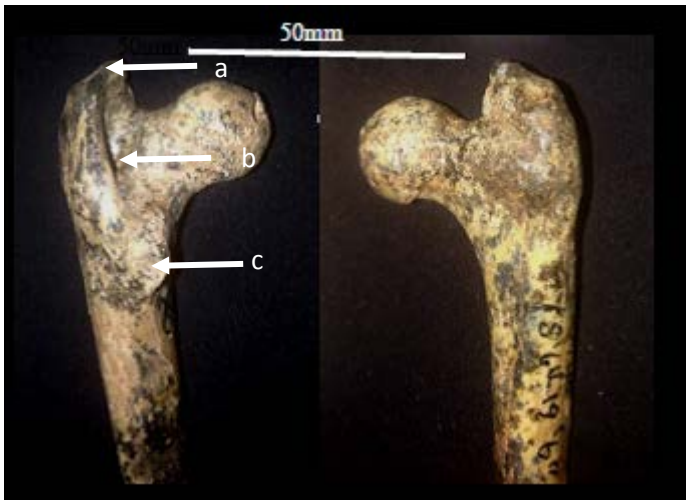


Figure 4.12. SF 5496. Note the superior extension, and inclination of the greater tuberosity (a), a large deeply cavitated intertrochanteric fossa (b) located at the same level as the head, (c) and a medially facing lesser tuberosity.

- SWP 526, a left proximal femur:
  The greater trochanter is not preserved. The intertrochanteric groove is deep and lies at the same level as the head. The lesser trochanter is medially facing.

- SWP 746, a left proximal femur:
  The specimen is missing the head and both trochantae. It is flaked and cracked. The intertrochanteric groove is deep, small and at the same level as the head. The lesser trochanter is medially facing.

- SWP 1(invisible number)85, a left proximal femur:
  The greater trochanter is broken off on this specimen. It only preserves the head and lesser trochanter.

- SWP 1171, a left proximal femur:
  The specimen is highly fragmented. The greater trochanter is missing its proximal surface. The intertrochanteric groove is deep and at the same level as the head. The lesser trochanter is dorsally facing.

- SWP 1203, a left proximal femur:
  The femoral head articular surface lacks obvious dorsal extension towards greater trochanter. The greater trochanter is slightly broken off proximally; it is oriented parallel to the femoral head. The intratrochanteric fossa is small and deeply excavated and lies at same level as femoral head. The intratrochanteric groove is narrow with parallel margins. The lesser trochanter has a long base, a parabolic profile and is oriented dorsally.

- SWP 1263, a left proximal femur:
  The proximal greater trochanter is not preserved on this specimen. The intertrochanteric groove is deep and at the same level as the head. The lesser trochanter is medially oriented.

- SWP 1385, a left proximal femur:
  The intertrochanteric groove is flaked off. The femoral head articular surface lacks obvious dorsal extension towards the greater trochanter. The greater trochanter is blunt superiorly, and is oriented parallel to femoral head. The lesser trochanter has a long base with a parabolic profile. The region of the intertrochanteric groove is filled with breccia. The lesser trochanter faces more medially than dorsally.

- SWP 1206, a left proximal femur head fragment:
  The specimen preserved is a head fragment; however it is consistent with *Papio*/*Papio* sp morphology. The head has a spherical shape. The *fovea capitis* is postero-distally located. It is elongated in the medio-lateral axis.

- SWP 1698, a left proximal femur fragment:
  The intertrochanteric groove and fossa are fragmented and filled with breccia. The femoral head articular surface lacks obvious dorsal extension to the greater trochanter. The greater trochanter has a sharply pointed apex and is parallel to the femoral head. The lesser trochanter is fragmented but has a long base with parabolic profile and faces more medially than dorsally.

- SWP 531, a right proximal femur:
  The greater trochanter is missing its proximal surface. The intertrochanteric groove is deep and at the same level as the head. The lesser trochanter is medially facing.

- SWP 532, a right proximal femur:
  The specimen has robust muscle attachments. The greater trochanter is elevated above the head and faces medially. The lesser trochanter is dorsally facing and very stout. The intertrochanteric fossa is deep.

- SWP 533, a right proximal femur:
  The greater trochanter is missing its proximal surface. The intertrochanteric groove is deep and lies at the same level as the head. The lesser trochanter is medially facing. The fovea capitis is rounded and anterior facing.

- SWP 1008, a right proximal femur:
  The specimen is missing the trochantae. The intertrochanteric fossa is deeply cavitated and lies at the same level as the head. The fovea capitis is posterior facing and oval.

- SWP 4103, a right proximal femur:
  The greater trochanter is broken off proximally and was glued such that no diagnostic assessment can be made from this portion of the specimen. The femoral head articular surface bears no obvious dorsal extension toward the greater trochanter. The intertrochanteric groove and fossa are covered by breccia and are fragmented. The lesser trochanter has a long base with parabolic profile and faces more medially than dorsally.

*Locomotor adaptation of specimens identified as Papio/Parapapio* sp

The fossil remains assigned to the *Papio*/*Parapapio* sp class have character traits which could not be designated to either genus but can be differentiated from other papionins discovered at the Sterkfontein cave site. The major characters mainly point to terrestrial locomotion. The proximal humerus, which, in this study, is used to distinguish between the two genera bore ambiguous traits, the greater tuberosity lies on the same level as the head or is missing. The distal humerus the medial trochlea distal lip extends distally, a feature associated with terrestrial locomotion, contrary to a distal lip which is moderately developed as seen in semi-terrestrial and arboreal monkeys (Benefit *et al*. 2008). The radii do not possess the distinctive furrow in the bicipital tuberosity and demonstrate terrestrial features observed in other papionins. The ulna superior olecranon is missing on these specimens. The femur, one of the skeletal elements whose morphology covaries with locomotion, possesses a greater trochanter which projects superior to the head, a feature consistent with powerful hind limb extension motion (Harrison &Harris 1996; Hlusko 2007)

| | |
|---|---|
| Subfamily | Cercopithecinae Gray 1921 |
| Tribe | Papionini Burnett 1828 |
| Subtribe | Papionina Burnett 1828 |
| Genus | cf. *Theropithecus.* I. Geoffroy, Saint-Hilaire1843 |

Within the assemblage there is a subset of specimens which are, on average, larger than the three groups already discussed, and, they possess very robust muscular attachments. These are tentatively classed as cf. *Theropithecus* sp.

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a) Ulna

Ten ulnae form part of the assemblage. These specimens are different from other specimens in the assemblage. They are robust with defined muscular attachments. These have the following features 1) The olecranon superior aspect morphology is concave and inclined with lateral aspect higher than the medial aspect; 2) the olecranon superior projection is elevated but less than trochlea notch length; 3) the centre of the olecranon process is retroflexed 4) the trochlea notch shape is crescentic; 5) the coronoid process is in horizontal plane with no significant distal extension and 6) the anconeal process articular surface is oriented in horizontal plane with no significant proximal extension; 7) the trochlea notch preserves a curved ridge in its lateral corner; 8) medially, the olecranon is deeply concave for attachment of extensive *m. flexor carpi ulnaris* and the *m. flexor digitorium profundus* muscles. 9) All specimens bear a robust ulna shaft groove distal to the coronoid process; 10) the radial notch is bean-shaped and bears a deep groove distally. All these features are consistent with ulnae described as *Theropithecus*, e.g., KNM-ER 1572 from the upper Burgi member of Koobi Fora (Jablonski *et al.* 2008)

- SWP 822, a left proximal ulna:

  This specimen is chipped off on the posterior olecranon process. The olecranon process superior aspect morphology is flat with medial and lateral aspects of roughly equal heights. The olecranon superior projection is less than trochlea notch length, and even though the shaft is absent, the centre of the process is retroflexed. The trochlea

notch is crescentic in shape. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process articular surface is oriented in horizontal plane with no significant proximal extension.

- SWP 1104, a left proximal ulna:
  The olecranon superior morphology is flat with the lateral aspect slightly elevated than the medial aspect. Its projection is less than trochlea notch length and even though the shaft is absent, the centre of the process is retroflexed. The trochlea notch is crescentic in shape. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process is oriented in horizontal plane with no significant proximal extension.

- SWP 1110, a left proximal ulna:
  The olecranon process superior aspect morphology is concave with the lateral aspect elevated higher than the medial aspect. The anconeal process is in horizontal plane with no significant proximal extension. Olecranon superior projection is less than trochlea notch length and even though the shaft is absent, the centre of the process is to be aligned with the long process of the ulna. The trochlea notch is crescentic in shape. The coronoid process is in horizontal plane with no significant distal extension.

- SWP 1156, a left proximal ulna:
  The olecranon process superior aspect morphology is flat with medial and lateral aspects of roughly equal heights. The olecranon superior projection is less than trochlea notch length and is retroflexed. The trochlea notch is crescentic in shape. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process lies in horizontal plane with no significant proximal extension.

- SF 3418 (Fig 4.14), a right proximal ulna:
  The olecranon superior aspect morphology on this specimen is concave and inclined with lateral aspect higher than medial. The anconeal process is in horizontal plane with no significant proximal extension. The olecranon superior aspect is less than the trochlea notch length and is retroflexed. The trochlea notch is crescentic in shape. Medially, the olecranon is deeply concave for attachment of *m. flexor carpi ulnaris*

and the *m. flexor digitorium profundus* muscles but fades away immediately distal to the coronoid process. The coronoid process is in horizontal plane with no significant distal extension. The ulna shaft groove distal to the coronoid process is present. The radial notch is bean-shaped and has the deep groove below it. The lateral edge has a groove on the lateral side. The trochlea notch preserves a curved ridge in its lateral corner.

- SWP 825, a right proximal ulna:
  The olecranon process is chipped off on the proximo-posterior aspect. The olecranon process height is less than the trochlea notch. The trochlea notch is crescentic. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process articular surface is in horizontal plane with no significant proximal extension. The deep depression below the radial notch is present. The lateral aspect of the trochlea notch bears a curved proximo-distally oriented ridge.

- SWP 1148, a right proximal ulna:
  The olecranon is missing its superior aspect. The trochlea notch is crescentic. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process articular surface is in horizontal plane with no significant proximal extension. The deep depression below the radial notch is present. The lateral aspect of the trochlea notch bears a curved proximo-distally oriented ridge.

- SWP 1578, a right proximal ulna:
  The olecranon superior aspect is concave and inclined with the lateral aspect higher than the medial aspect. The anconeal process is in horizontal plane with no significant proximal extension. The olecranon superior aspect is less than the trochlea notch length and its posterior aspect is retroflexed. The trochlea notch is crescentic in shape. The coronoid process is in horizontal plane with significant distal extension. The ulna shaft groove distal to coronoid process is present. The radial notch is bean-shaped and has the deep groove below it. The trochlea notch preserves a curved ridge in its lateral corner.

- SWP 4001, a right proximal ulna:

The olecranon superior aspect morphology of this specimen is concave with its lateral aspect higher than the medial aspect. The anconeal process is in horizontal plane with no significant proximal extension. The olecranon superior aspect is less than the trochlea notch length and is retroflexed. The trochlea notch is crescentic in shape. The coronoid process is in horizontal plane with significant distal extension. The ulna shaft groove distal to coronoid process is present. The radial notch is bean-shaped and has the deep groove below it. The trochlea notch preserves a curved ridge in its lateral corner.

- SWP 4084, a right proximal ulna:

  The olecranon superior aspect morphology of this specimen is concave with the lateral aspect elevated higher than the medial aspect. The olecranon postero-superior aspect is retroflexed. The trochlea notch is crescentic in shape. The trochlea notch and the olecranon superior projection are almost the same height. The coronoid fossa and anconeal process are in horizontal plane. The coronoid process is in horizontal plane and is flattened. The anconeal process is also in horizontal plane with significant proximal extension. The ulna shaft groove distal to the coronoid process is present. The radial notch is bean-shaped and has the deep groove below it.


Figure 4.13. On the left is SWP 1104, a left cf. *Theropithecus* proximal ulna and on the right is KNM-ER 1572, *Theropithecus oswaldi* from Koobi Fora. SWP 1104 demonstrates the superior projection of the olecranon (a), the concave medial face of the olecranon (b) and the deep ridge distal to the coronoid fossa (c).

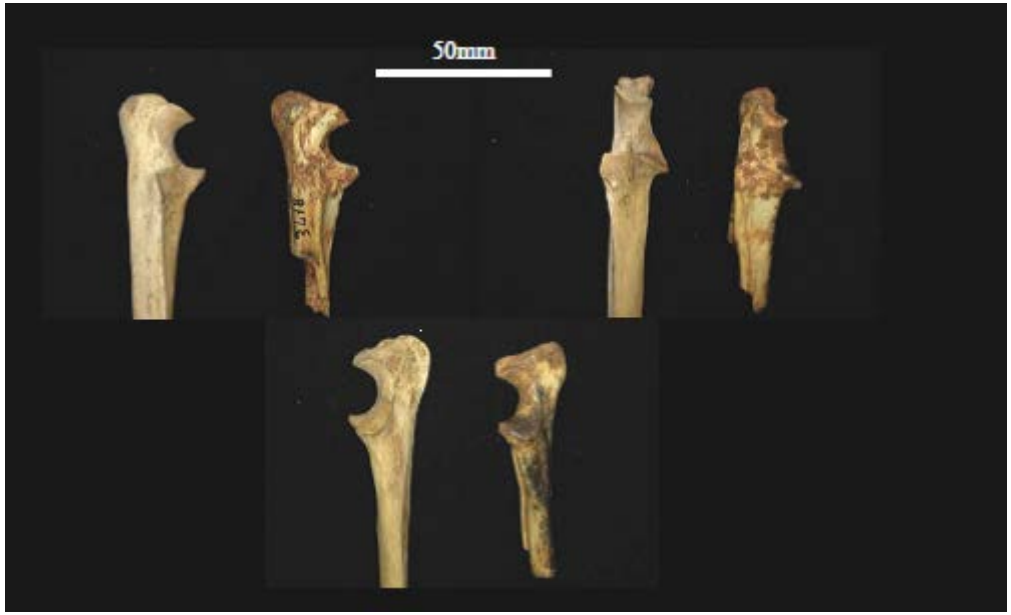


Figure 4.14. A right modern *P. ursinus* ulna and SF 3418, a right proximal cf. *Theropithecus sp* ulna.

b) Femur

Three proximal femora are tentatively assigned to cf. *Theropithecus* sp. Common features in these femora include- 1) a large greater trochanter with a proximal tip that lies above the head; it is higher in *Theropithecus* sp than in *Papio* sp.; 2) the superior extension of the greater trochanter points medially; 3) the lateral border of the greater trochanter is concave it is a distally oriented u-shape and is located slightly lower than the intertrochanteric fossa, whereas in *Papio* sp this feature is mainly rugose and is located more superiorly than in *Theropithecus* sp. 4) there is no obvious dorsal extension from the greater trochanter to the head; 5) The superior surface between the neck and the head is wider, more open, and flattened than in *Papio* sp. 6) the femoral head faces superiorly; 7) the neck is relatively long 8) the lesser trochanter is short with a parabolic profile and; 9) it faces dorso-medially; 10) the shaft is convex anteriorly and angles laterally.

- SWP 528, a left proximal femur:

  The greater trochanter is large and its proximal tip lies above the head and points medially. The femoral head faces superiorly. The neck is very long.. The supero-lateral border of the greater tuberosity is concave. The superior surface between the neck and the head is flat. The lesser tuberosity is short with a parabolic profile and faces dorsally. The shaft is convex anteriorly and angles laterally.

- SWP 4039, a left proximal femur, and SWP 4153, a right proximal femur (Fig. 4.15):

  These specimens are very similar and are likely to be from the same individual. The femoral heads are superiorly inclined. The *foveae capitis* are horizontally elongated with a slight nodule on the superior surface. The femoral head articular surface lacks obvious dorsal extension toward the greater tuberosity. The greater trochantae have a blunt apex and are medially inclined. The antero-medial border of the greater tuberosity is very shallow, unlike that of *Papio* sp, which is deep. The lateral border of the greater trochanter is concave. The intertrochanteric fossa is long and deeply excavated and lies on the same level as the femoral head. It is relatively narrow with parallel margins. The lesser trochanter has a long base with a parabolic profile and is

oriented more medially than dorsally. SWP 4039 preserves a shaft which has a slight - lateral bow.

*Locomotor adaptation of specimens identified as cf. Theropithecus* sp

The Sterkfontein fossil *Theropithecus* is a large, robust and highly terrestrial cercopithecoid which, based on the sizes of the specimens, most likely towered above other cercopithecines in the environment. No humerus specimens are identified for this genus; therefore no assumptions are made about the shoulder joint. The ulna morphology resembles other papionins and suggests that the specimens begged to individuals who frequented terrestrial niches (Fleagle 1983). The upper femur has a head which lies below the greater trochanter, restricts hip abduction and is therefore associated with terrestrial adaptations (Smith & Savage 1956).

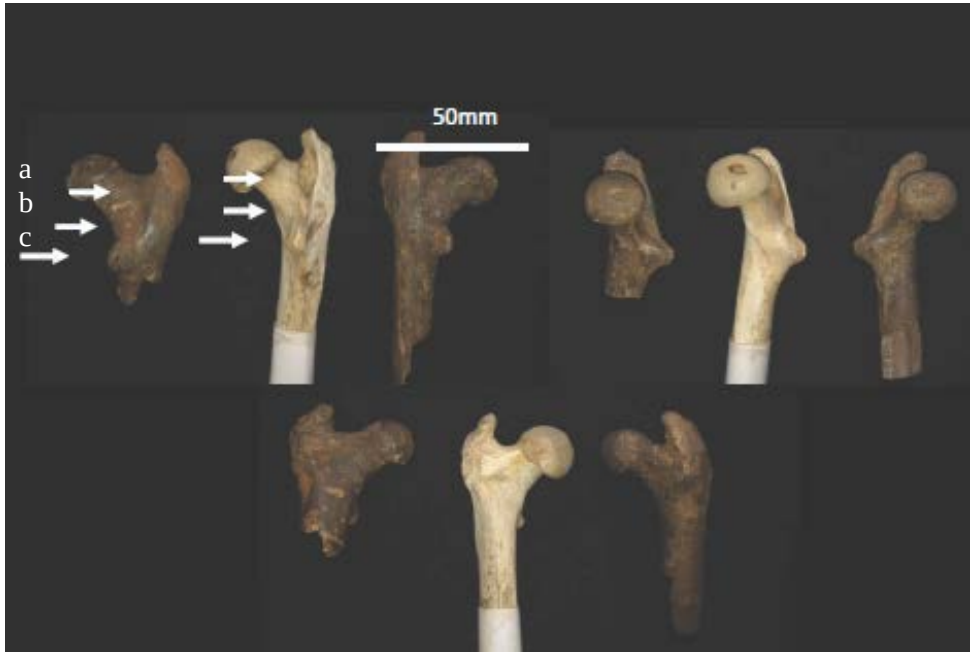


Figure 4.15. From left to right, cf. *Theropithecus sp* femora, SWP 4153, modern *Papio ursinus* BPI/C/541 and *Theropithecus sp*, SWP 4039 on the right. The arrows demonstrate a medially facing greater trochanter (a), an extensive intertrochanteric groove in *Theropithecus* (b) and a medially facing lesser trochanter which is more dorsally facing in *Papio* (c) and a laterally inclined shaft in *Theropithecus* (d).

Subfamily Cercopithecinae Gray 1921

Tribe Papionini. Burnett 1828

This sub-assemblage preserves features which are generally consistent with the first four groups, however, due to limited preservation of diagnostic morphological traits', they are categorised as a separate group.

a) Humerus

Eighteen humeri form part of this group. These specimens have varying degrees of preservation; they however preserve general papionin characteristics. They are highly fragmented and do not preserve sufficient morphology to assign them to a genus. The specimens have 1) a hemispherical head shape; 2) the lesser tuberosity is continuous from the head; 3) the shaft is approximately straight 4) distally, the shaft is thick and rounded; 5) they also preserve a retroflexed medial epicondyle; 6) the dorsal pillars are wider and thicker above the lateral epicondyle; 7) the trochlea is narrow; 8) its medial distal lip is medially oriented; 9) the capitulum is rounded. These features are consistent with papionin morphology.

- SWP 993, a right proximal humerus:
  The specimen preserves a greater tuberosity and head fragment. The head shape is hemi-spherical. The greater tuberosity surface is convex, therefore excluding it from being a theropithecine. The intertubercular groove is deeply excavated with sharply defined medial and lateral edges.

- STS 2185, a right proximal humeral lateral head fragment:
  The specimen only preserves the lateral aspect of the head. The head is hemi-spherical in shape.

- SF 4610, a right distal humerus fragment:
  Only the distal shaft and proximal part of the olecranon fossa are preserved on this specimen. The distal shaft is thick and rounded.

- SWP 726, a right distal humerus fragment:
  This specimen is similar to specimen SF 4610. It is a fragment preserving the shaft and no condyles. The distal shaft is thick and rounded.

- SWP 1539, a right distal humerus fragment:
  Only the capitulum and lateral epicondyle are preserved on this specimen. The lateral epicondyle has a small dorsal surface with minimum projection above the level of the olecranon fossa. In the proximo-distal axis, the capitulum's medio-lateral width is narrowed distally.

- SWP 963, a left proximal humerus fragment:
  The head is proximo-distally compressed. The specimen only preserves the head fragment.

- SWP 965, a left proximal humerus fragment:
  The head is proximo-distally compressed as observed in other specimens.

- S94-9257, a left proximal humerus head fragment:
  The head is proximo-distally compressed.

- STS 2074, a left distal humerus:
  This is a highly broken specimen with only the lateral epicondyle and less than a third of the distal shaft preserved. The distal shaft is rounded and asymmetrical.

- SWP 1544, an unsided proximal humerus fragment:
  This specimen is a humerus head fragment with a greater tuberosity. The head is hemi-spherical in shape. The greater tuberosity superior extension is lower than the level of the humeral head. The specimen is highly fragmented.

- SWP 727, a left distal humerus fragment:
  The distal shaft is thick and rounded. As seen in *Papio*nins, the distal dorsal pillars are wider and thicker above the lateral epicondyle.

- SWP 729, a left distal humerus:

  The specimen preserves less than a third of the shaft distally. The distal shaft is thick and rounded. The distal dorsal pillars are wider and thicker above the lateral epicondyle. The medial and lateral edges of the shaft are oriented asymmetrically.

- SWP 1543, a left distal humerus:

  Only the distal articular surface and medial epicondyle are preserved. The capitulum is broken off on its lateral aspect. The medial epicondyle is retroflexed. The lateral epicondyle is not preserved. The trochlea is narrow and its medial lip distal projection is short and in straight line with the humeral shaft.

- SWP 1581, a left distal humerus:

  The epicondyles and the trochlea are broken off. The capitulum is narrowed distally. The olecranon fossa is triangular.

- SWP 1583, a left distal humerus:

  This specimen preserves a fragment of the distal shaft, the epicondyles and the olecranon fossa. It is the second largest humerus specimen in the whole Sterkfontein assemblage. This character state is observed in *Papio*nins (Jablonski *et al.* 2002). The medial epicondyle is larger and retroflexed. The lateral epicondyle has a small face with minimal projection above the level of the olecranon fossa. The trochlea breadth is narrow, and its medial lip distal projection is short and medially inclined relative to the humeral shaft. The capitulum is rounded and it has an uneven width in the proximo-distal axis. It also bears an extensive surface area for radial articulation. The capitulum shape and position are indicative of the level or ability of upper arm movement. The olecranon fossa is triangular in shape. The triangular ridges of this specimen are very defined and the outline is more open. This specimen is very robust compared to other specimens identified in the Sterkfontein fossil cercopithecoid sub-assemblage. The specimen resembles specimen KNM-ER 17723 from Koobi Fora, which is *Theropithecus oswaldi* (Jablonski *et al.* 2008). However, due to its small size, it is assigned to Papionini.

- SWP 4099, a left distal humerus:

  This specimen preserves a lateral condyle and less than a third of the shaft distally. Its morphology shows a large dorsal face with a tall wall facing the olecranon fossa. The olecranon is broken off proximo-distally.

- STS 1264, a left distal humerus:

  This humerus is embedded in breccias. It preserves the distal condyles and more than a third of the shaft distally. Therefore most of the morphology cannot be ascertained. It has a rounded and asymmetrical distal shaft.

- STS 27(invisible number), a left distal humerus:

This specimen is a distal humerus fragment without condyles. The distal shaft is asymmetrical and rounded. It is wider and thicker above the lateral epicondyle.

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b) Ulna

Twenty-nine ulnae are discussed below. These have the following traits, 1) the trochlea notch is crescentic in shape; 2) the surface orientation of the anconeal process is in horizontal plane with no significant proximal extension; 3) the coronoid process lies in horizontal plane with no significant distal extension; 4) distal to the coronoid process, the ulna bears a shaft groove; 5) the olecranon superior aspect morphology is concave with the lateral aspect higher than medial; 6) the olecranon superior projection is less than the trochlea notch length and it is retroflexed; 7) the radial notch has a deep groove distally.

d) SWP 817, a left proximal ulna with less than a third of the shaft preserved proximally:

The olecranon proximo-distal length is less than the trochlea height.

- SWP 1(invisible number)79: a left proximal ulna with less than a third of the shaft preserved proximally:

  The olecranon and proximal portion of the trochlea are broken off.

- SWP 1513, a left proximal ulna with less than a third of the shaft preserved proximally:
  This specimen is highly fragmented. The olecranon is retroflexed.

- SWP 1566, a left proximal ulna with less than a third of the shaft preserved proximally:
  This specimen's olecranon is retroflexed. Its whole proximal aspect is fragmented.

- SWP 1567, a left proximal ulna fragment with less than a third of the shaft preserved proximally:
  The ulna is missing the proximal olecranon. The olecranon is retroflexed. The trochlea notch shape is crescentic.

- SWP 1575, a left proximal ulna fragment with less than a third of the shaft preserved proximally:
  This specimen is highly fragmented. The proximal olecranon is missing; however the rest of the olecranon is retroflexed.

- SWP 1604, a right proximal ulna:
  The olecranon is concave with lateral aspect higher than medial. Its antero-posterior length is 27.32mm. The specimen is disintegrated. The olecranon superior projection is less than the trochlea notch length and is retroflexed. The anconeal process is in horizontal plane with no significant proximal extension. The trochlea notch is crescentic. The shaft does not have a groove distal to the coronoid process.

- BP/3/23028, a left proximal ulna with less than a third of the shaft preserved proximally:
  The specimen is missing the proximal olecranon process. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- BP/3/23093, a left proximal ulna with less than a third of the shaft preserved proximally:

This specimen is also missing the proximal olecranon process. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- SF 4611, a left proximal ulna with less than a third of the shaft preserved proximally:
  The proximal olecranon process is not preserved. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- SWP 1197, a left proximal ulna with less than a third of the shaft preserved proximally:
  This specimen is also missing the proximal olecranon process. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- SWP 1285, a left proximal ulna with less than a third of the shaft preserved proximally:
  The olecranon proximo-distal height is much smaller than the trochlea notch length. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- SWP 1560, a left proximal ulna with less than a third of the shaft preserved proximally:
  This specimen is also missing the proximal olecranon process. Only the radial notch, a fragment of the shaft distal to the trochlea notch and a fragment of the coronoid process are preserved. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- S94-13152, a left proximal ulna fragment with less than a third of the shaft preserved proximally:

S94-13152 is highly fragmented; only the coronoid process and distal end of trochlea notch are preserved. The coronoid process is in horizontal plane with no significant distal extension. The shaft groove below the coronoid process is present.

- SWP 4015, a left proximal ulna:

  This specimen is very muscular suggesting that it belongs to a robust *Papio*nin. The olecranon superior aspect morphology is slightly rounded with the lateral and medial aspects which are roughly equal in height. The olecranon is retroflexed. The olecranon superior projection is less than trochlea notch length. The robust nature of this specimen suggests that it belongs to a robust papionin.

- BP/3/23718, a right proximal ulna fragment:

  BP/3/23718 preserves the trochlea notch, the coronoid process, and less than a third of the shaft distally. The trochlea notch is crescentic. The coronoid process articular surface is in horizontal plane with no significant distal extension. The shaft groove distal to the coronoid process is present.

- SF 1465, a right proximal ulna fragment:

  The anterior surface of the specimen is missing. The coronoid process is also partly preserved, but it is chipped off laterally.

- SWP 815, a right proximal ulna:

  This specimen only preserves the coronoid process, the radial notch and less than a third of the shaft. The coronoid process is in horizontal plane with no significant distal extension. The deep depression below the radial notch is also present. .

- SWP 1213, a right proximal ulna:

  The olecranon is missing the proximal and anterior aspect. The trochlea notch has a crescentic shape. The coronoid process is broken off medially. Its articular surface orientation is in horizontal plane with no significant distal extension. The depression below the radial notch is present.

- SWP 1291, a right proximal ulna missing the olecranon superior aspect:

The olecranon process is broken off on the superior and the lateral aspect of the specimen. The coronoid process is missing proximally; distally it does not preserve significant distal extension. It has a depression below the radial notch. .

- SWP 1574, a right proximal ulna missing the olecranon superior aspect:
  The specimen is highly flaked. The anconeal process is in horizontal plane with no significant proximal extension. Only the trochlea notch and the anconeal process are discernible. The trochlea notch is crescentic in shape.

- SWP 2813, a right proximal ulna missing the olecranon superior aspect:
  The surface orientation of the anconeal process is in horizontal plane with no significant proximal extension. The shaft groove distal to the coronoid process is absent. The wide groove below the radial notch is present and flanked by ridges on both the medial and lateral side.

- SWP 561, a right proximal ulna:
  This specimen is highly fragmented. The superior olecranon, the coronoid process and the radial notch are broken off. The remaining portion of the olecranon is retroflexed. The radial notch is bean-shaped and distal to it are deep medial and lateral ridges.

- SWP 813, a right proximal ulna:
  The specimen does not preserve the superior olecranon. The olecranon is retroflexed. The trochlea notch has a crescentic shape.

- SWP 816 a right proximal ulna:
  SWP 816 does not preserve even a small portion of the proximal shaft. It preserves features which suggest that it belonged to a robust papionin. The trochlea notch is broken off proximally. The coronoid process is reduced medially. The radial notch is bean-shaped and has a deep, sharp proximo-distal ridge laterally. The lateral aspect of the olecranon is concave. The deep ridge lateral to the trochlea notch is present.

- SWP 1561, a right proximal ulna:

The anconeal process is broken off. The olecranon superior aspect morphology is concave; the lateral aspect is higher than the medial aspect. The olecranon superior projection is less than trochlea notch length and is retroflexed. The trochlea notch shape is crescentic. The coronoid process articular surface is in horizontal plane with no significant distal extension. The deep groove below the radial notch is present.

- SWP 1563, a right proximal ulna:
  The anconeal process is broken off but is to be in horizontal plane with no significant proximal extension. The olecranon superior aspect morphology is concave with lateral aspect higher than medial. The olecranon superior projection is less than the trochlea notch length and it is retroflexed. The trochlea notch is crescentic. The coronoid process articular surface is in horizontal plane with no significant distal extension. The deep groove below the radial notch is present.

- SWP 1573, a right proximal ulna:
  This specimen is highly fragmented. It is missing the anconeal process and the anterior trochlea notch. The ulna shaft groove distal to the coronoid process and the shaft groove distal to the radial notch are present. In lateral view, the olecranon process has a shaft groove posterior to the trochlea notch.

e) SWP 4098, a right proximal ulna:
   The specimen is highly fragmented and cemented together by breccia. The olecranon process is less than the trochlea notch length. The coronoid process is the most diagnostic morphology preserved; it is in horizontal plane with no significant distal extension. The trochlea notch has a proximo-distal groove on the lateral corner. Below the radial notch, there is a deep and defined depression.

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c) Radius

Twenty-nine radii specimens are identified which preserve papionin characteristics. The specimens grouped in this category preserve little diagnostic morphology to be assigned to a

genus. The general radial morphology observed is that 1) the head shape is ovoid; 2) the lateral aspect lies lower than the medial aspect 3) the neck is relatively short; 4) the bicipital tuberosity is a rough lateral projection. The specimens are discussed below.

- BP/3/23235, a left proximal radius:
  The head shape is slightly medio-laterally compressed. The lateral aspect is lower than the medial aspect. The shaft is nearly straight. The bicipital tuberosity is elongated proximo-distally.

- SF 2689, a left proximal radius:
  The specimen is a radius shaft which is missing the head. The bicipital tuberosity is a proximo-distally elongated protuberance with a furrow antero-laterally. The head is broken off. The shaft is nearly straight.

- SWP 808, a left proximal radius:
  This specimen is highly flaked, only the anterior and posterior aspects of the head are preserved. In superior view the head has a depression. The angle of the lateral aspect indicates that it is lower than the medial aspect. The shape of the head is ovoid. The shaft is nearly straight.

- SWP 4087, a left proximal radius:
  The specimen is broken off on the proximo-medial side. The head shape is ovoid. The shaft is nearly straight.

- BP/3/31553, a left proximal radius without a shaft:
  The head shape is ovoid.

- SF 1553, a left radius head without a shaft:
  The head is chipped off posteriorly and has a nearly round shape. .

- SWP 4063, a left radius head without a shaft:
  The radius' whole medial portion is missing. The head shape is ovoid.

- SWP 1139, a right proximal radius:
  This specimen is missing the unfused head. It is a juvenile right radius shaft with an elongated bicipital tuberosity which preserves a furrow antero-medially.

- SF 3484, a right proximal radius with at least a third of the shaft preserved proximally:
  The radius is broken off distally below longitudinal tuberosity. Its head shape is nearly round. The lateral aspect is lower than the medial. The bicipital tuberosity is a proximo-distal protuberance which has an anterio-medial furrow.

- SWP 799, a right proximal radius with at least a third of the shaft preserved proximally:
  This is a flaky specimen with the anterior portion of the head missing. The head shape is nearly round. The lateral aspect is lower than the medial aspect. The bicipital tuberosity is missing.

- SWP 4059, an unsided radius head:
  The head is ovoid. The lateral aspect and the medial aspect lie approximately on the same level.

- SWP 797, an unsided radius head:
  The specimen is chipped off on the lateral aspect. The head is ovoid. The lateral aspect and the medial aspect are approximately on the same level.

- SWP 255, an unsided radius head:
  The head has a deep depression in superior view. It is ovoid in shape. The lateral aspect and medial aspect lie approximately on the same level.

- SWP 506, an unsided radius head:
  The head is ovoid in shape and has a deep depression in superior view. The lateral aspect and medial aspect lie approximately on the same level.

- SWP 4005, an unsided radius head with a fragment of the neck

The head has a deep depression proximally. It is ovoid in shape. The medial and the lateral aspects lie on the same level.

- Unnumbered STS, a right proximal radius with less than a third of the shaft preserved proximally:
  This is one of the radii with robust papionin characteristics. The head shape is ovoid. The lateral aspect is lower than the medial aspect. The bicipital tuberosity is very pronounced.

- SWP 516, a right proximal radius:
  The shape of the head is ovoid. Similar to other radial heads, its proximal attachment has a deep depression. The lateral aspect of the head is lower than the medial aspect. The bicipital tuberosity is elongated proximo-distally and bears a furrow on its antero-medial side.

- SWP 519, a left proximal radius:
  The head proximal articulation has a deep depression. It is nearly rounded. The lateral aspect is lower than the medial aspect. The bicipital tuberosity is elongated proximo-distally.

- SWP 979, a right proximal radius:
  The radius head is depressed in superior view and is nearly rounded. The lateral aspect is lower than the medial aspect. The bicipital tuberosity is elongated proximo-distally and bears a furrow anterio-medially.

- SWP 1125, a right proximal radius:
  The shape of the head is nearly round. The lateral aspect of the head is broken off; however the head angle suggests that it lay lower than the medial aspect. In superior view, the head is depressed. The bicipital tuberosity surface is elongated proximo-distally and bears a longitudinal furrow on its antero-medial side.

- SWP 1306 (this specimen is missing the posterior portion of the head):
  The head is depressed in superior view. It is nearly rounded and broken off on the lateral aspect. The lateral aspect is missing but as observed in specimen SWP 1125 the angulation of the head suggests that the lateral aspect was lower than the medial aspect. The bicipital tuberosity is elongated proximo-distally.

- SWP 1416, a right proximal radius:
  The shape of the head is ovoid to nearly round. In superior view, the head is depressed. The lateral aspect of the head is lower than the medial aspect. The bicipital tuberosity surface is elongated proximo-distally.

- SWP 520, a left proximal radius:
  This specimen preserves the head and neck only. The head shape is ovoid. It has a small neck.

- SWP 792, a left proximal radius:
  This specimen is broken off posteriorly. Head shape is ovoid. The lateral and medial aspects are approximately on the same level. The bicipital tuberosity is broken off distally; however, it is elongated proximo-distally.

- SWP 806, a left proximal radius:
  The radius head is completely chewed off, and only the postero-lateral aspect is preserved. The bicipital tuberosity is elongated proximo-distally.

- SWP 972, a left proximal radius:
  In superior view the head has a deep depression and has an ovoid shape. Its lateral aspect is approximately on the same level as the medial aspect. The bicipital tuberosity is broken off.

- SWP 1198, a left proximal radius:
  This specimen does not preserve a head. The bicipital tuberosity is elongated proximo-distally as observed.

- SWP 1308, a left proximal radius:

  Similar to SWP 1198 and SWP 806, no head is preserved on this specimen. The bicipital tuberosity is elongated proximo-distally.

- SWP 1162, an unsided proximal radius:

  This specimen is a very large radial head which is highly flaked, fragmented and is missing its lateral part. The head is ovoid in shape. The head slopes laterally.

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d) Femur

Twenty-four femora with characteristics consistent with Papionini indet. morphology, are identified. 1) the Sterkfontein Papionini indet. femur has a lesser trochanter which faces medially; 2) the head articular surface lacks obvious dorsal extension toward the greater trochanter; 3) the intertrochanteric fossa is small, deeply cavitated, and 4) lies at the same level as the femoral head 5) the lesser trochanter has a long base with a parabolic or triangular profile; 6) the *fovea capitis* is located medial to the head and extends dorsally 7) it is deep and rounded in shape 8) the medial condyle surface area exceeds the lateral condyle 9) the condyles are splayed; 10) the femur distal shaft morphology is thick and rounded.

- SWP 527, a left proximal femur:

  The head on this specimen is broken off on the whole anterior portion. The greater trochanter is also broken off on its superior aspect. The lesser trochanter is medially facing. The greater trochanter lateral surface is lightly concave.

- SWP 529, a left proximal femur:

  The greater tuberosity is not preserved on this proximal femur. The lesser trochanter is medially facing. The intertrochanteric fossa is very shallow and almost non-existent. The neck is flat antero-posteriorly.

- SWP 530, a left proximal femur:

  The specimen preserves the head and neck only. The *fovea capitis* is oval and deep.

- SWP 738, a left proximal femur:

  The specimen is missing the head. The lesser trochanter is laterally facing due to cracking of the specimen and subsequent cementing with breccia. The intertrochanteric fossa is deep and lies at the same level as the head. The greater trochanter lateral surface has robust muscle attachment. The fovea capitis preserves a flange on its proximal aspect.

- SWP 743, a left proximal femur:

  The specimen preserves only the lesser trochanter and less than a third of the shaft. The lesser trochanter is extensive and faces dorso-medially.

- SWP 1154, a left proximal femur:

  This specimen only preserves a fragment of the neck, greater trochanter and intertrochanteric fossa which is deeply cavitated.

- SWP 1536, a right proximal femur with less than a third of the shaft preserved proximally:

  The greater trochanter is robust, extensive and pointed superiorly. The superior extension of the greater trochanter is higher. There is no obvious dorsal extension from the greater trochanter to the head. The superior surface between the neck and the head is more flattened than in *Papio* which bears a u-shaped surface. The lateral border of the greater trochanter is concave and defined in a distally oriented u-shape located slightly lower than the intertrochanteric fossa. The lesser trochanter is dorso-medial facing with a parabolic profile.

- SWP 1537, a left proximal femur:

  The greater trochanter is large and robust; it lies above the head and is medially oriented. The femoral head faces superiorly. The supero-lateral border of the greater trochanter is concave and has robust muscle attachments for the *gluteus medius* tendons. The superior surface between the neck and the head is flat. The lesser trochanter is short with a parabolic profile. It also faces dorsally.

- SWP 1697, a right proximal femur with less than a third of the shaft preserved proximally:

  The greater trochanter is also big and medially facing rather than superiorly inclined. There is no obvious dorsal extension between the greater trochanter and head. The superior surface between the neck and the head is more flattened. The lateral surface of the greater trochanter is concave. The lesser trochanter is broken off. The deep proximo-distally elongated groove distal to the coronoid process is present.

- SWP 1699, a left proximal femur:

  Only the head, neck, base of the lesser trochanter and a bit of the shaft are preserved on this specimen. The whole lateral portion of the specimen is missing. The head bears no obvious dorsal extension to the greater trochanter. The lesser trochanter is more medially inclined than dorsal.

- SWP 1706, a left proximal femur:

  All the epiphyses are chipped off. Only the shaft fragment, intertrochanteric fossa and distal potion of the neck are preserved. The intertrochanteric fossa is deeply cavitated and is positioned at the same level as the head. The lesser trochanter base is medio-dorsally facing.

- SWP 4035, a left proximal femur:

  The greater trochanter is broken off and preserves less than a third of the shaft proximally. The lesser trochanter is medially facing. The femoral head articular surface lacks obvious dorsal extension toward the greater tuberosity. The intertrochanteric fossa is broken of proximally but it is small, deeply cavitated, and lies at the same level as the femoral head. The lesser trochanter has a long base with a parabolic profile.

- SWP 742, a right proximal femur:

  The specimen is broken off on the whole proximal aspect. It preserves only the distal portion of the head, the lesser trochanter and less than a third of the shaft proximally. The lesser trochanter is extensive and faces dorso-medially.

- SWP 745, a right proximal femur:

This specimen is a femur head and neck which are broken off medio-laterally and glued together on the neck. The *fovea capitis* is rounded and deep. It preserves a flange on its proximal aspect.

- SWP 754, a right proximal femur:
  This specimen preserves only the intertrochanteric fossa and a lesser trochanter. The intertrochanteric groove is deep and lies at the same level as the head.

- SWP 900, a right proximal femur:
  This specimen is a femur head with a proximal greater trochanter. The *fovea capitis* is located on the posterior portion of the head. It is deep and oval with a flange on its proximal aspect.

- SWP 905, a right proximal femur:
  The lesser trochanter and less than a third of the shaft constitute this specimen. The lesser trochanter tip is chipped off and is medially facing.

- SWP 1514, a right proximal femur:
  This specimen is similar to SWP 905. It preserves the lesser trochanter and less than a third of the shaft. The lesser trochanter is dorso-medially facing. The intertrochanteric fossa is deep and elongated proximo-distally.

- SWP 1355, a right proximal femur:
  This specimen is weathered and missing the proximal greater trochanter and proximal portion of the head. It preserves the lesser trochanter and less than a third of the shaft. The lesser trochanter base is medially facing.

- SWP 1384, a right proximal femur:
  This specimen is a head, intertrochanteric fossa and is missing both the greater and lesser trochantae. The neck is broken off proximally. The *fovea capitis* is rounded and anterior facing.

- SWP 1704, a right proximal femur:

The femoral head articular surface bears obvious dorsal extension towards the greater trochanter. The greater trochanter is blunt and pointed superiorly. The intertrochanteric fossa is covered in breccia. The intertrochanteric groove is small, deeply cavitated and at same level as the femoral head. The lesser trochanter has a long base with a parabolic profile and it faces more dorsally than medially.

- SWP 1534, a left distal femur:
  This specimen is missing the lateral anterior condyle. The medial condyle surface area exceeds the lateral condyle. The condyles are splayed. The femur distal shaft morphology is thick and rounded.

- SWP 1532, a right distal femur:
  The distal shaft on this specimen is asymmetrically flattened superior to the condyles. The condyles are splayed, and the medial condyle is larger than the lateral condyle.

- SWP 753, a right proximal femur:
  The femur head is spherical. The greater trochanter is robust and projects superior to the femur head. The *fovea capitis* is located medial to the head and extends dorsally. It is deep and rounded in shape. The lesser trochanter has a triangular outline. The intertrochanteric fossa is small, rounded, deeply cavitated and lies at the same level as the head.

*Locomotor adaptation of specimens identified as Papionini indet*

They are highly fragmented and do not preserve sufficient morphology to assign them to genus level. The general papionin morphology observed includes a hemispherical head shape, an approximately straight humeral shaft which is the shaft is thick and rounded distally; they also preserve a retroflexed medial epicondyle; and a rounded capitulum. On the ulna, the trochlea notch is crescentic in shape, the olecranon superior aspect morphology is concave with the lateral aspect higher than medial; the olecranon superior projection is less than the trochlea notch length and it is retroflexed. These features are consistent with terrestrial papionin morphology (Rose 1974, 1997; Fleage 1983; Harrison 1989). The femur bears a lesser trochanter which faces medially while the medial condyle surface area exceeds the lateral condyle.

Figure 4.16. SWP 1537, a left Papionini indet proximal femur. Note the greater trochanter which is elevated superior to the head, its medial orientation and a lesser trochanter which is also medially oriented.

Figure 4.17. SWP 738, a left Papionini indet proximal femur fragment.

Subfamily Cercopithecinae Gray, 1821

Tribe Cercopithecini Gray, 1821

Genus *Cercopithecus.* Brunnich, 1772

In the assemblage, two specimens that likely represent the same individual, are assigned to *Cercopithecus* sp. The *Cercopithecus* sp. specimens point to gracile individuals.

a) Humerus

BP/3/34170, a left distal humerus fragment:

The olecranon fossa is shallow. The medial epicondyle is retroflexed. The trochlea medial lip distal projection is very short compared to *Papio* sp and projects medially. The shaft distal dorsal pillars are wider and thicker above the lateral epicondyle. This fossil element has a very high and rounded olecranon fossa. The capitulum is relatively flatter than in *Papio*.

b) Radius

SWP 4012, a proximal radius:

The head is ovoid. In superior view, it bears a deep rounded depression. The lateral aspect is lower than the medial aspect. The bicipital tuberosity is half circular with a flange distally. The neck is relatively long. The neck and the shaft are medio-laterally flattened. The shaft has a slight lateral bow.

*Locomotor adaptation of specimens identified as Cercopithecus* sp

The fossil *Cercopithecus* points to a small individual with a combination of terrestrial adaptations with arboreal capabilities. The humerus lacks the proximal aspect therefore assumptions about the shoulder joint cannot be made. The retroflexed medial epicondyle shows similarities to what is seen in terrestrial quadrupeds (Harrison 1989). The reduced distal projection of the trochlea is similar to *Cartelles* which occupy arboreal habitats, which is different from what is observed in papionins (Halenar & Rosenberger 2013). The longer radial neck increases the lever arm for the biceps, which is consistent with semi-terrestrial and arboreal locomotion seen in suspensory *Ateles* (Jones 2008).

| | |
|---|---|
| Subfamily | Colobinae, Jerdon 1867 |
| Tribe | Colobini Blyth 1875 |
| Genus | cf. *Cercopithecoides*. Mollet 1947 |

One specimen, a femur, compares to *Cercopithecoides* sp.

- SWP 883, a left proximal femur:

  The specimen has a very long neck. The posterior aspect of the neck has an oval proximo-laterally angled fossa. Above this fossa is a flange which faces proximo-posterior to the head. The specimen's anterior surface is very flat. The intertrochanteric fossa is small, rounded, deeply cavitated and lies at the same level as the head.

*Locomotor adaptation of specimens identified as <u>Cercopithecoides</u>* sp

The *Cercopithecoides* femur points to a specimen which belonged to a terrestrially adapted fossil monkey. The long femoral neck length relates to increased mechanical advantage of the lesser gluteal muscles by lengthening their lever arm, a feature consistent with terrestrial locomotion seen in terrestrial papionins (Harrison and Harris 1996).

Subfamily Colobinae Jerdon 1867

Tribe Colobini Blyth 1875

Subtribe Colobina indet.

a) Ulna

Four ulnae are assigned to Colobina indet. These specimens are highly fragmented. 1) the olecranon superior aspect is the same length as the trochlea notch; and 2) it is retroflexed. 3) the olecranon process is concave and the lateral aspect is higher than the medial; 4) the trochlea notch is big and crescentic in shape; 5) the coronoid process is in horizontal plane with no significant distal extension; 6) the anconeal process is also in horizontal plane with no significant proximal extension, 7) the anconeal process and the coronoid process are robust and create a deeply crescentic trochlea notch.

- S94-10836, a right proximal ulna:
  The olecranon superior aspect is less than the trochlea notch; it is almost non- existent. The trochlea notch has a half circular shape. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process is also reduced in appearance. The olecranon process is flat superiorly; however, the lateral aspect is higher than the medial aspect.

- S94 13505, a left proximal ulna:
  The olecranon superior aspect is less than the trochlea notch; it is almost non-existent and it is retroflexed. The olecranon process is flat superiorly but the lateral aspect is slightly higher than the medial. This is different from papionin specimens, which have a superior projection which is highly unequal in height. The trochlea notch is big and crescentic in shape. The coronoid process is in horizontal plane with no significant distal extension. The anconeal process is also in horizontal plane with no significant proximal extension. The anconeal process and the coronoid process are robust and create a deeply crescentic appearance for the trochlea notch interiorly.

- SWP 1258, right proximal ulna fragment:

This specimen only preserves a small distal portion of the coronoid process and less than a third of the proximal shaft. The specimen's shaft is very flat anterior-posteriorly. The coronoid process articular surface is in horizontal plane with no significant distal extension. The radial notch is very deep and has a circular outline.

- SWP 4247

  The olecranon process is long. It is not as retroflexed as observed in Cercopithecines. The olecranon bears a superiorly inclined medial flange. On the medial aspect, the olecranon superior portion is deeply with a medial flange posteriorly. The trochlea notch proximo-distal height is almost the same as the proximal extension of the olecranon notch. The radial notch is oval. The shaft is flat medio-laterally.

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Figure 4.18. On the left, SWP 4247, a proximal ulna Colobinae indet specimen and, on the right, a modern *Colobus guezara* ulna.

b) Radius

SF 2567, a left proximal radius with more than a third of the shaft preserved proximally:

This specimen is one of the largest radii in the Sterkfontein cercopithecoid assemblage. The head is ovoid in shape with the lateral aspect higher than the medial aspect. The radius is thin. Colobines have thin radii compared to cercopithecines (Krentz 1993). This indicates a larger range of pronation and supination (*ibid.*). The neck is short relative to the size of the specimen. The shaft is laterally bowed.

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c) Femur

SWP 1163, a left proximal femur which preserves a lesser trochanter, intertrochanteric fossa and less than a third of the shaft:

The lesser trochanter on this specimen has a relatively short base with a triangular profile. It is medially oriented rather than dorso-medially. The intertrochanteric fossa is deep.

*Locomotor adaptation of specimens identified as Colobina indet*

The upper arm on the identified fossil colobine specimens from Sterkfontein points to arboreal locomotion. The extensive olecranon process seen in SWP 4247 is consistent with arboreally adapted monkeys; this feature is also observed in Miocene *Aegyptopithecus* (Rose 1997). Other specimens have a short olecranon which is not retroflexed. A short olecranon process which is aligned to the long axis of the ulna, which provides for rotational ability in the gleno-humeral joint, is recorded for arboreal adapted colobines (Mcphee & Horovitz 2002) The extent and orientation of the olecranon process, combined with a wide trochlea notch are features also seen in arboreal species such as *Paracolobus* from Lemudong'o in Kenya (Hlusko 2007). Therefore, from the locomotor repertoire a minimum of two different species are likely represented in the indeterminate colobines.

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### 4.1.2. **Qualitative morphological comparisons**

Taxonomic analyses of primate postcranial remains in the Plio-Pleistocene have relied on association with cranio-dental specimens. To date, within the Stekfontein caves fossil cercopithecoid assemblage, there has been no fossil cercopithecoid postcranial remains directly associated with crania in southern African fossil cave sites. This section provides a morphological comparison of these limb bones.

a) *The humerus- projection of the greater tuberosity relative to the head*

Ten specimens are assessed for the level of the greater tuberosity in relation to the humeral head. The first group (*Papio*) consists of six proximal humeri (BP/3/22757, SWP 960, SWP967, SWP 1201, SWP 1276 and SWP 1406). On all these specimens the greater tuberosity projects above the level of the head. The second group of specimens classed as *Parapapio* (SWP 504, SWP 959 and SWP 962) have a greater tuberosity which lies below the level of the head. This implies a flexible scapula-humeral joint associated with arboreal movements (Fleagle and Simons 1982), which is in contrast to the first group. Specimen SWP 2792 is separate from the first two groups and has a greater tuberosity which lies at the same level as the head.

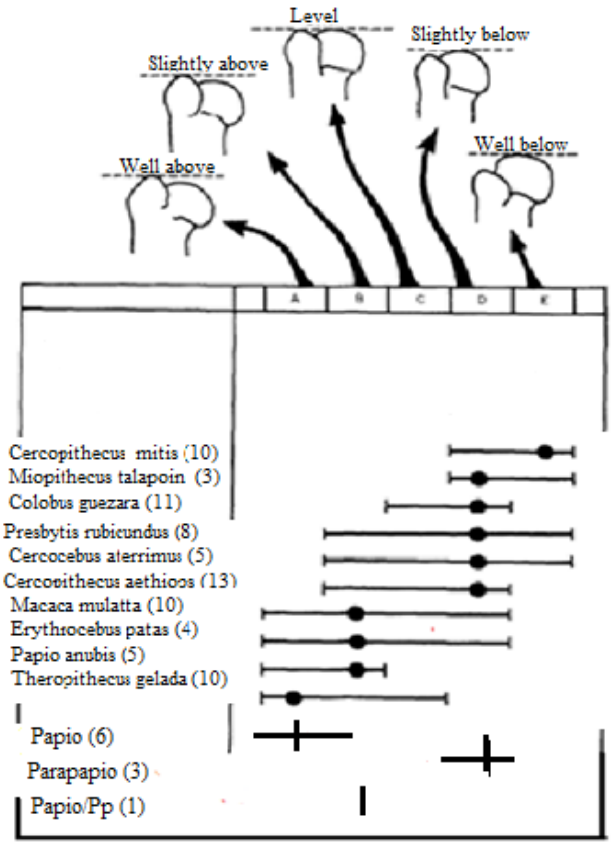


Figure 4.19. Extension of greater tuberosity relative to the humeral head. Data on taxa follows Harrison 1989)

Table 4.1. Qualitative assessment of the humerus based on taxa

| **Trait** | ***Parapapio* sp** | ***Papio* sp** | ***Papio*/*Papio* sp** | ***Papio*nini indet.** | ***Cercopithecus* sp.** |
|---|---|---|---|---|---|
| **Head shape** | hemi-spherical | hemi-spherical | hemi-spherical | hemi-spherical | |
| **Greater tuberosity relative to lesser** | larger | larger | larger | larger | |
| **Projection of greater tuberosity relative to head** | below | above | same level | | |
| **Shaft shape** | nearly straight | nearly straight | nearly straight | nearly straight | |
| **Distal shaft dorsal wall above lateral epicondyle** | thick | thick | thick | thick | thick |
| **Medial epicondyle size relative to lateral epicondyle** | narrower | narrower | narrower | equal | narrower |
| **Retroflexion of medial epicondyle** | retroflexed | retroflexed | retroflexed | retroflexed | retroflexed |
| **Trochlea medial lip distal projection** | long | long | long | long | short |
| **Trochlea medial lip alignment** | medial | medial | medial | medial | medial |
| **Olecranon fossa shape** | triangular | elongated-ellipsoid | rounded | | rounded |
| **Capittulum shape** | rounded | rounded | rounded | | flatter |

Table 4.2. Qualitative assessment of the ulna based on taxa

| | ***Parapapio* sp** | ***Papio* sp** | ***Papio*/*Papio* sp** | ***Theropithecus* sp** | ***Papio*nini indet.** | ***Cercopithecoides* sp.** | **Colobinae sp.** |
|---|---|---|---|---|---|---|---|
| **Olecranon superior shape** | concave | concave | concave | flat | concave | rounded | concave |
| **Olecranon lateral and medial aspect height** | unequal | unequal | unequal | equal | unequal | equal | unequal |
| **Olecranon superior projection** | retroflexed | retroflexed | retroflexed | retroflexed | retroflexed | straight | straight |
| **Olecranon height vs trochlea notch height** | less | less | less | slightly less | less | less | same |
| **Trochlea notch shape** | crescentic | crescentic | crescentic | crescentic | crescentic | crescentic | deeply crescentic |
| **Anconeal process on medial view** | anconeal is sharp | anconeal is thick | | anconeal is thick and flat anteriorly | | flat | extensive |
| **Proximal olecranon medial view** | flat | flat | flat | concave | flat | rounded | |
| **Coronoid process** | flat | flat | flat | flat | | flat | extensive |

Table 4.3. Qualitative assessment of the radius based on taxa

| | *Parapapio* sp | *Papio* sp | *Papio*/*Papio* sp | *Theropithecus* sp | Papionini indet. | *Cercopithecus* sp. |
|---|---|---|---|---|---|---|
| Head shape | ovoid | ovoid | ovoid | Ovoid | Ovoid | ovoid |
| Head lateral aspect vs medial | lower | lower | lower | lower | lower | lower |
| Neck height | long | short | short | short | | Short |
| Bicipital tuberosity | central furrow | No furrow | | No furrow | | Half circular with a nodule |

Table 4.4. Qualitative assessment of the femur based on taxa

| | ***Parapapio* sp** | ***Papio*/*Parapio* sp** | ***Theropithecus* sp** | **Papionini indet.** | ***Cer opithecoides*** | ***Colobini*** |
|---|---|---|---|---|---|---|
| **Greater trochanter superior projection** | Above | Above | Above | | | above |
| **Greater trochanter orientation** | Medial | Proximal | Medial | | | medial |
| **Greater trochanter lateral surface area** | Flat | Flat | Concave | Concave | | |
| **Lesser trochanter surface area flattened** | | Medial | Dorsal | Medial and dorsal | | Medial |
| **Intertrochanteric fossa** | | Deep | Deep | Shallow and deep | Deep rounded | Deep |
| **Shaft shape** | | Approximately straight | bowed | Approximately straight | | |

Tables 4.5-4.33 provide descriptive statistics of the humerus, ulna, radius and femur in the Sterkfontein fossil cercopithecoid assemblage (in bold font) compared to descriptive statistics of the modern comparative samples in normal font. All measurements are in millimetres

Table 4.5. Descriptive statistics of the humerus proximal medio-lateral breadth (PMLB)

| **Taxa** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **3** | **27.93** | **32.92** | **29.57** | **2.89552** | **9.79** |
| ***Papio*** | **3** | **21.03** | **24.06** | **27.56** | **2.6865** | **13.6** |
| *Papio sp* | 10 | 25 | 34 | 39 | 2.8643 | 9.87 |
| ***Papio/Parapapio*** | **1** | **22.35** | **22.35** | **22.35** | | |
| ***Papionin*** | **1** | **37.54** | **37.54** | **37.54** | | |
| *Cercopithecus aethiops* | 9 | 15 | 18.3 | 17.14 | 1.2164 | 7.9 |
| *Colobus guezara* | 4 | 20 | 26 | 23.675 | 2.6094 | 11.02 |
| *Mandrillus sphinx* | 1 | 26 | 26 | 26 | | |

Table 4.6. Descriptive statistics of the humerus head diameter (HHD)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **3** | **15.86** | **17.35** | **16.07** | **1.1845** | **7.369** |
| ***Papio*** | **7** | **24.5** | **30.64** | **25.81** | **3.02579** | **9.8** |
| *Papio sp* | 10 | 12.69 | 26 | 21.539 | 3.8419 | 17.83 |
| ***Papio/Parapapio*** | **11** | **17.45** | **30.26** | **27.75** | **4.328** | **15.5** |
| *Cercopithecus aethiops* | 10 | 10.91 | 14.9 | 13.946 | 4.4058 | 31.359 |
| *Colobus guezara* | 4 | 15.5 | 19.9 | 18.3 | 2.0607 | 11.2608 |
| *Mandrillus sphinx* | 1 | 21 | 21 | 21 | | |

Table 4.7. Descriptive statistics of the humerus anterior posterior length of humeral head (APLHH)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **3** | **17.69** | **20.94** | **19.29** | **1.62531** | **8.423** |
| ***Papio*** | **3** | **16.4** | **20.86** | **21.74** | **4.1138** | **19.715** |
| *Papio sp* | 10 | 23.2 | 28.31 | 25.252 | 2.5001 | 9.900 |
| ***Papio/Parapapio*** | **1** | **14.95** | **14.95** | **14.95** | | |
| *Cercopithecus aethiops* | 7 | 13.36 | 15.5 | 14.7386 | 0.67 | 4.545 |
| *Colobus guezara* | 4 | 17.21 | 20.1 | 19.05 | 1.8267 | 9.588 |
| *Mandrillus sphinx* | 1 | 22.6 | 22.6 | | | |

Table 4.8. Descriptive statistics of the humerus. greater tuberosity diameter (GTD)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **3** | **16.39** | **20.68** | **18.06** | **2.19477** | **12.015** |
| ***Papio*** | **7** | **13** | **16.32** | **19.03** | **2.28179** | **13.978** |
| *Papio sp* | 10 | 15 | 19.8 | 17.202 | 2.3422 | 0.136157 |
| ***Papio/Parapapio*** | **1** | **15.57** | **15.57** | **15.57** | | |
| *Cercopithecus aethiops* | 9 | 9 | 12 | 10.7156 | 1.268 | 11.832 |
| *Colobus guezara* | 4 | 12.9 | 16.4 | 14.4 | 1.6912 | 11.744 |
| *Mandrillus sphinx* | 1 | 13 | 13 | | | |

Table 4.9. Descriptive statistics of the humerus bi-epicondylar breadth (BEB)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **7** | **27.09** | **35.36** | **30.2** | **3.06243** | **10.121** |
| ***Papio*** | **7** | **18.4** | **24.54** | **31.69** | **4.87972** | **19.88** |
| *Papio sp* | 10 | 31 | 44 | 34.659 | 3.7652 | 10.837 |
| ***Papio/Parapapio*** | **1** | **34.79** | **34.79** | **34.79** | | |
| *Cercopithecus aethiops* | 9 | 17 | 23.1 | 20.9367 | 2.1136 | 10.0954 |
| *Colobus guezara* | 4 | 26 | 34.9 | 30.275 | 9.9246 | 12.963 |
| *Mandrillus sphinx* | 1 | 33 | 33 | | | |

Table 4.10. Descriptive statistics of the humerus medial trochlea flange length (MTFL)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **8** | **10.27** | **19.34** | **15.92** | **3.13503** | **20.048** |
| ***Papio*** | **7** | **15.34** | **20.23** | **25.08** | **3.2149** | **15.891** |
| *Papio sp* | 10 | 16.17 | 18.9 | 17.786 | 2.0851 | 11.723 |
| ***Papio/Parapapio*** | **11** | **11.3** | **18.31** | **15.23** | **2.77** | **18.2** |
| ***Papionin*** | **2** | **15.11** | **16.45** | **15.78** | **0.9475** | **6.133** |
| *Cercopithecus aethiops* | 9 | 8 | 12.1 | 10.45 | 1.1951 | 11.428 |
| *Colobus guezara* | 4 | 9.1 | 12.3 | 11.075 | 1.3913 | 12.562 |
| *Mandrillus sphinx* | 1 | 13.2 | 13.2 | | | |

Table 4.11. Descriptive statistics of the humerus lateral epicondyle to medial edge of trochlea (LEMET)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **7** | **25.2** | **33.24** | **27.26** | **2.79231** | **10.243** |
| ***Papio*** | **7** | **20.27** | **27.1** | **32.64** | **4.514** | **13.82** |
| *Papio sp* | 10 | 28 | 34.9 | 31.31 | 2.8196 | 9.0052 |
| ***Papio/Parapapio*** | **11** | **21.46** | **33.64** | **26.82** | **3.662** | **13.653** |
| ***Papionin*** | **1** | **32.06** | **32.06** | **32.06** | | |
| *Cercopithecus aethiops* | 9 | 14.7 | 19.4 | 17.5533 | 1.5181 | 8.6448 |
| *Colobus guezara* | 4 | 21 | 28 | 25.025 | 2.9556 | 11.8107 |
| *Mandrillus sphinx* | 1 | 26 | 26 | | | |

Table 4.12. Descriptive statistics of the humerus. distal articular breadth (DAB)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **8** | **18.52** | **24.55** | **21.005** | **2.34561** | **11.167** |
| ***Papio*** | **3** | **8.73** | **12.19** | **15.77** | **3.52137** | **28.879** |
| *Papio sp* | 10 | 23.4 | 30 | 25.525 | 2.3284 | 9.12 |
| ***Papio/Parapapio*** | **13** | **15** | **26.74** | **19.76** | **3.103** | **15.52** |
| ***Papionin*** | **2** | **15.68** | **22.72** | **19.2** | **4.978** | **25.92** |
| *Cercopithecus aethiops* | 9 | 11 | 16.2 | 13.4467 | 1.6191 | 12.0411 |
| *Colobus guezara* | 4 | 17.1 | 24.9 | 20.525 | 3.3521 | 15.8443 |
| *Mandrillus sphinx* | 1 | 22.6 | 22.6 | | | |

Table 4.13. Descriptive statistics of the humerus proximo-distal height of capitulum (PDHC)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **7** | **12.38** | **15.79** | **13.22** | **1.27407** | **9.415** |
| ***Papio*** | **4** | **18.7** | **21.98** | **25.33** | **3.03285** | **13.798** |
| *Papio sp* | 10 | 13.69 | 18 | 14.949 | 1.3462 | 9.005 |
| ***Papio/Parapapio*** | **14** | **10** | **15.1** | **11.22** | **1.947** | **17.34** |
| ***Papionin*** | **5** | **5.68** | **15.02** | **11.612** | **3.502** | **30.18** |
| *Cercopithecus aethiops* | 9 | 7.38 | 18 | 9.9289 | 3.341 | 0.33364 |
| *Colobus guezara* | 4 | 8 | 14.9 | 10.75 | 2.9331 | 0.27285 |
| *Mandrillus sphinx* | 1 | 11 | 11 | | | |

Table 4.14. Descriptive statistics of the humerus maximum medio-lateral length of olecranon fossa (MMLLO)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **7** | **11.23** | **15.79** | **13.06** | **1.38616** | **10.609** |
| ***Papio*** | **9** | **10.02** | **13.13** | **14.5** | **1.68971** | **12.865** |
| *Papio sp* | 8 | 12.1 | 26.2 | 15.0589 | 4.5809 | 3.04 |
| ***Papio/Parapapio*** | **11** | **8.01** | **14** | **11.2** | **1.706** | **15.22** |
| ***Papionin*** | **1** | **14.32** | **14.32** | **14.32** | | |
| *Cercopithecus aethiops* | 9 | 9.02 | 14.2 | 11.35 | 1.9182 | 16.900 |
| *Colobus guezara* | 4 | 11 | 14.2 | 13.325 | 1.5521 | 11.648 |
| *Mandrillus sphinx* | 1 | 12.3 | 12.3 | | | |

Table 4.15. Descriptive statistics of the humerus maximum proximo-distal length of olecranon fossa (MPDLO)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **7** | **7.02** | **14.64** | **10.07** | **2.41498** | **22.719** |
| ***Papio*** | **10** | **4.41** | **8.8** | **11.9** | **1.91651** | **21.779** |
| *Papio sp* | 9 | 9.8 | 19 | 11.9956 | 3.1772 | 26.48 |
| ***Papio/Parapapio*** | **10** | **4.41** | **13.36** | **10.06** | **2.564** | **25.4** |
| ***Papionin*** | **1** | **10.44** | **10.44** | **10.44** | | |
| *Cercopithecus aethiops* | 8 | 4.9 | 9.62 | 6.8 | 1.5097 | 22.201 |
| *Colobus guezara* | 4 | 8 | 11 | 9.2 | 1.4697 | 15.974 |
| *Mandrillus sphinx* | 1 | 11 | | | | |

Table 4.16. Descriptive statistics of the humerus axis of medial epicondyle (AME)

| ***Taxa*** | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **7** | **25** | **46** | **35.57** | **7.11471** | **20.001** |
| ***Papio*** | **8** | **31** | **41** | **36.371** | **3.7773** | **10.38** |
| *Papio sp* | 10 | 30 | 40 | 38 | 3.496 | 9.200 |
| ***Papio/Parapapio*** | **11** | **18** | **40** | **30.54** | **8.248** | **27.9** |
| ***Papionin*** | **2** | **21** | **43** | **32** | **15.556** | **48.61** |
| *Cercopithecus aethiops* | 9 | 34 | 44 | 38.555 | 2.9202 | 7.574 |
| *Colobus guezara* | 4 | 23 | 30 | 27 | 3.559 | 13.181 |
| *Mandrillus sphinx* | 40 | 40 | 40 | | | |

Table 4.17. Descriptive statistics of the ulna anterior-posterior length of olecranon process (APLOP)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **2** | **26.5** | **19.96** | **23.23** | **4.62448** | **19.907** |
| ***Papio*** | **5** | **17.01** | **26.50** | **21.81** | **3.78145** | **17.34** |
| *Papio sp* | 8 | 22 | 34 | 25.7013 | 3.5746 | 13.908 |
| ***Papio/Parapapio*** | **5** | **18.34** | **24.51** | **22.07** | **7.9295** | **13.27** |
| ***Theropithecus*** | **10** | **15.91** | **28.03** | **23.088** | **4.2517** | **18.41** |
| ***Papionin*** | **4** | **19.24** | **25.31** | **22.042** | **3.1061** | **14.0** |
| *Cercopithecus aethiops* | 7 | 7.9 | 16.9 | 12.5829 | 3.2918 | 26.160 |
| *Colobus guezara* | 4 | 7.4 | 16.1 | 12.7 | 3.8549 | 30.353 |
| *Mandrillus sphinx* | 2 | 6 | 10.3 | 8.15 | 3.0406 | 37.307 |

Table 4.18. Descriptive statistics of the ulna proximo-distal height of olecranon process (PDHOP)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **2** | **12.8** | **9.89** | **11.345** | **2.05768** | **18.137** |
| ***Papio*** | **5** | **6.81** | **12.8** | **9.09** | **2.45103** | **26.97** |
| *Papio sp* | 8 | 10 | 16.15 | 3.1255 | 3.1255 | 25.996 |
| ***Papio/Parapapio*** | **7** | **3.98** | **10.17** | **7.8** | **2.156** | **27.62** |
| ***Theropithecus*** | **10** | **8.3** | **14.34** | **10.028** | **2.948** | **29.39** |
| ***Papionin*** | **4** | **6.03** | **10.38** | **8.15** | **2.1771** | **26.7** |
| *Cercopithecus aethiops* | 7 | 6 | 10.82 | 8.5514 | 2.606 | 30.474 |
| *Colobus guezara* | 4 | 7.4 | 16.1 | 12.7 | 3.8549 | 30.353 |
| *Mandrillus sphinx* | 2 | 6 | 10.3 | 8.15 | 3.0406 | 37.3071 |

Table 4.19. Descriptive statistics of the ulna medio-lateral breadth of olecranon process (MLBOP)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **2** | **10.5** | **8.99** | **9.745** | **1.06773** | **10.957** |
| ***Papio*** | **5** | **9.11** | **11.71** | **10.32** | **0.97549** | **9.449** |
| *Papio sp* | 8 | 11 | 15 | 12.8588 | 1.3093 | 10.182 |
| ***Papio/Parapapio*** | **12** | **7.16** | **11.94** | **10.14** | **1.332** | **13.12** |
| ***Theropithecus*** | **10** | **6.23** | **14.41** | **11.025** | **2.1172** | **19.14** |
| ***Papionin*** | **7** | **9.72** | **11.94** | **10.92** | **0.7156** | **6.55** |
| *Cercopithecus aethiops* | 7 | 7.24 | 9.48 | 7.95 | 0.7302 | 9.183 |
| *Colobus guezara* | 4 | 9.5 | 11.8 | 10.75 | 0.9469 | 8.808 |
| *Mandrillus sphinx* | 2 | 10.2 | 11 | 10.6 | 0.5657 | 5.336 |

Table 4.20. Descriptive statistics of the ulna proximo-distal length of trochlea notch (PDLTN)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **2** | **17.2** | **10.96** | **14.08** | **4.41235** | **31.33** |
| ***Papio*** | **5** | **13.66** | **17.2** | **15.05** | **1.48361** | **9.85** |
| *Papio sp* | 7 | 14.2 | 18.9 | 17.0262 | 1.9085 | 11.209 |
| ***Papio/Parapapio*** | **10** | **11.37** | **20.36** | **14.71** | **2.5533** | **16.84** |
| ***Theropithecus*** | **10** | **8.07** | **20.36** | **14.577** | **3.5109** | **24.08** |
| ***Papionin*** | **8** | **10.15** | **16.93** | **13.79** | **2.5537** | **85.1** |
| *Cercopithecus aethiops* | 6 | 7.6 | 11.8 | 9.765 | 1.407 | 14.4680 |
| *Colobus guezara* | 4 | 11.2 | 14.1 | 12.325 | 1.242 | 10.0768 |
| *Mandrillus sphinx* | 2 | 13 | 13 | 13 | | |

The radius

Table 4.21. Descriptive statistics of the radius maximum dimension of radial head (MDRH)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **5** | **14.26** | **17.73** | **15.198** | **1.61077** | **10.119** |
| ***Papio*** | **10** | **13.3** | **18.06** | **15.346** | **1.59561** | **10.398** |
| *Papio sp* | 9 | 14.2 | 18 | 16.437 | 1.2932 | 7.86 |
| ***Papio/Parapapio*** | **3** | **14.74** | **17.08** | **15.81** | **1.182** | **7.48** |
| ***Papionin*** | **19** | **13.25** | **19.52** | **16.144** | **1.3449** | **0.08.51** |
| *Cercopithecus aethiops* | 8 | 8.5 | 9.1 | 9.4387 | 0.6062 | 6.4226 |
| *Colobus guezara* | 8 | 7.9 | 16 | 13.3 | 3.6615 | 27.5301 |
| *Mandrillus sphinx* | 2 | 15 | 15.2 | 15.1 | 0.1414 | 0.936 |

Table 4.22. Descriptive statistics of the radius perpendicular breadth of radial head (PBRH)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **3** | **12.74** | **15.4** | **14.46** | **1.49171** | **10.316** |
| ***Papio*** | **8** | **12.82** | **15.87** | **14.062** | **1.0525** | **07.484** |
| *Papio sp* | 9 | 9.5 | 16.8 | 15.0544 | 2.1927 | 14.564 |
| ***Papio/Parapapio*** | **3** | **13.15** | **15.31** | **14.353** | **1.1** | **7.67** |
| ***Papionin*** | **9** | **12.28** | **16.16** | **14.12** | **1.3921** | **9.85** |
| *Cercopithecus aethiops* | 8 | 7.8 | 9.37 | 8.6563 | 0.571 | 6.595 |
| *Colobus guezara* | 4 | 11 | 13.4 | 11.975 | 1.034 | 8.6346 |
| *Mandrillus sphinx* | 2 | 13.1 | 14 | 13.55 | 0.6364 | 4.6966 |

Table 4.23. Descriptive statistics of the ulna proximo distal height of radial neck (PDHRN)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **6** | **4.72** | **11.14** | **7.75** | **2.40687** | **30.957** |
| ***Papio*** | **10** | **5.4** | **9.74** | **6.99** | **1.29586** | **18.539** |
| *Papio sp* | 8 | 4.9 | 8 | 6.57 | 0.9121 | 13.882 |
| ***Papio/Parapapio*** | **1** | **8.16** | **8.16** | **8.16** | | |
| ***Theropithecus*** | | | | | | |
| ***Papionin*** | **18** | **4.72** | **10.41** | **7.433** | **1.8466** | **24.64** |
| *Cercopithecus aethiops* | 8 | 4 | 8.5 | 5.7525 | 1.4849 | 25.813 |
| *Colobus guezara* | 4 | 6 | 13.3 | 7.875 | 3.617 | 45.929 |
| *Mandrillus sphinx* | 2 | 5.9 | 7 | 6.45 | 0.7778 | 12.059 |

Table 4.24. Descriptive statistics of the radius proximo distal height of radial neck and head (PDHRNH)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Parapapio*** | **5** | **11.75** | **17.65** | **14.598** | **2.67943** | **18.355** |
| ***Papio*** | **10** | **10.31** | **16.15** | **12.76** | **1.83301** | **14.36** |
| *Papio sp* | 8 | 12 | 15.41 | 12.8889 | 1.1756 | 9.1213 |
| ***Papio/Parapapio*** | **1** | **10.22** | **10.22** | **10.22** | | |
| ***Papionin*** | **14** | **10.69** | **17.28** | **13.759** | **1.8534** | **13.46** |
| *Cercopithecus aethiops* | 8 | 7.1 | 13 | 9.4112 | 1.7394 | 18.482 |
| *Colobus guezara* | 4 | 7.2 | 15 | 10.65 | 3.2919 | 30.909 |
| *Mandrillus sphinx* | 2 | 12 | 12 | | | |

Femur

Table 4.25. Descriptive statistics of the femur anterior posterior head dimension (APHD)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **10** | **16.1** | **19** | **18.168** | **0.8617** | **4.7** |
| ***Theropithecus*** | | | | | | |
| ***Papionin*** | | | | | | |
| *Papio sp* | 10 | 20.9 | 25 | 22.222 | 1.7871 | 8.0421 |
| *Cercopithecus aethiops* | 7 | 10.9 | 13.23 | 12.134 | 0.9391 | 7.7390 |
| *Colobus guezara* | 4 | 16 | 17.8 | 17.05 | 0.7937 | 4.6552 |
| *Mandrillus sphinx* | 2 | 17.5 | 17.9 | 17.7 | 0.2828 | 15.9798 |

Table 4.26. Descriptive statistics of the femur medio-lateral breadth of femur head (MLBFH)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **10** | **13.82** | **17.18** | **15.96** | **1.2041** | **7.5** |
| *Papio sp* | 10 | 17.5 | 22 | 18.739 | 1.324 | 7.0655 |
| ***Theropithecus*** | **2** | **17.43** | **18.8** | **18.115** | **0.9687** | **5.34** |
| ***Papionin*** | **7** | **12.22** | **17.93** | **15.11** | **2.2153** | **14.66** |
| *Cercopithecus aethiops* | 7 | 8.2 | 10.98 | 10.2286 | 0.9629 | 9.4138 |
| *Colobus guezara* | 4 | 12.8 | 15.7 | 14.025 | 1.2121 | 8.642 |
| *Mandrillus sphinx* | 2 | 14.9 | 19.9 | 17.4 | 3.5355 | 20.3191 |

Table 4.27. Descriptive statistics of the femur greater trochanter projection (GTP)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **4** | **8.35** | **9** | **8.66** | **0.2891** | **3.3** |
| *Papio sp* | 9 | 9.5 | 14 | 11.5433 | 1.408 | 12.1973 |
| ***Theropithecus*** | **2** | **12.14** | **13.06** | **12.6** | **0.6505** | **5.16** |
| ***Papionin*** | **1** | **7.72** | **7.72** | **7.72** | | |
| *Cercopithecus aethiops* | 8 | 4.6 | 7.97 | 5.795 | 1.225 | 21.1397 |
| *Colobus guezara* | 4 | 6 | 9.1 | 7.1 | 1.3736 | 19.345 |
| *Mandrillus sphinx* | 2 | 6.6 | 7.4 | 7 | 0.5657 | 8.081 |

Table 4.28. Descriptive statistics of the femur neck diameter (ND)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **11** | **7.07** | **17.53** | **13.6** | **3.8742** | **28.4** |
| *Papio sp* | 10 | 9.11 | 21 | 15.867 | 3.1955 | 20.141 |
| ***Theropithecus*** | **2** | **16.8** | **16.93** | **16.865** | **0.0919** | **0.5** |
| ***Papionin*** | **6** | **13.33** | **17.21** | **15.23** | **1.6595** | **10.89** |
| *Cercopithecus aethiops* | 8 | 3.8 | 12.6 | 8.3288 | 2.4907 | 29.904 |
| *Colobus guezaara* | 4 | 9 | 16 | 13.5 | 3.1091 | 23.030 |
| *Mandrillus sphinx* | 2 | 8.7 | 9 | 8.85 | 0.2121 | 2.396 |

Table 4.29. Descriptive statistics of the femur medio-lateral neck diameter (MLND)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| *Papio sp* | 10 | 4 | 12.1 | 8.444 | 2.3671 | 28.0334 |
| ***Papio/Parapapio*** | | | | | | |
| ***Theropithecus*** | | | | | | |
| ***Papionin*** | | | | | | |
| *Cercopithecus aethiops* | 8 | 4 | 12.6 | 5.9463 | 2.915 | 49.0221 |
| *Colobus guezara* | 5 | 6.5 | 13.2 | 7.92 | 3.2813 | 41.430 |
| *Mandrillus sphinx* | 2 | 6 | 7 | 6.5 | 0.7071 | 10.878 |

Table 4.30. Descriptive statistics of the femur bi-epicondylar breadth (BEB)

| | N | Minimum | Maximum | Mean | SD | CV |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **1** | **34.83** | **34.83** | **34.83** | | |
| *Papio sp* | 10 | 28.5 | 42 | 35.477 | 3.6518 | 0.102933 |
| *Cercopithecus aethiops* | 7 | 18 | 22.38 | 20.72 | 1.5918 | 0.076822 |
| *Colobus guezara* | 4 | 28 | 32.5 | 30.6 | 1.8815 | 0.06148 |
| *Mandrillus sphinx* | 2 | 29 | 31.3 | 30.15 | 1.6262 | 0.05394 |

Table 4.31. Descriptive statistics of the femur neck shaft angle (NSA)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **8** | **104** | **125** | **114.25** | **6.8191** | **5.96** |
| *Papio sp* | 10 | 120 | 145 | 128.7 | 8.4202 | 6.542 |
| ***Theropithecus*** | **2** | **100** | **100** | **100** | **0** | **0** |
| ***Papionin*** | **2** | **112** | **120** | **116** | **5.6569** | **4.87** |
| *Cercopithecus aethiops* | 8 | 100 | 145 | 117.625 | 15.9458 | 13.5564 |
| *Colobus guezara* | 4 | 127 | 140 | 133 | 5.7155 | 4.2973 |
| *Mandrillus sphinx* | 2 | 125 | 135 | 133 | 5.7155 | 4.2973 |

Table 4.32. Descriptive statistics of the femur medial condyle width (MCW)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **1** | **11.65** | **11.65** | **11.65** | | |
| *Papio sp* | 10 | 11 | 18 | 12.244 | 2.9415 | 24.024 |
| ***Papionin*** | **1** | **11.65** | **11.65** | **11.65** | | |
| *Cercopithecus aethiops* | 8 | 5.5 | 8.54 | 7.2275 | 0.8526 | 11.7966 |
| *Colobus guezara* | 4 | 8.1 | 11.6 | 10.375 | 1.5543 | 14.9811 |
| *Mandrillus sphinx* | 2 | 13 | 17.5 | 15.25 | 3.182 | 20.8654 |

Table 4.33. Descriptive statistics of the femur lateral condyle width (LCW)

| | **N** | **Minimum** | **Maximum** | **Mean** | **SD** | **CV** |
|---|---|---|---|---|---|---|
| ***Papio/Parapapio*** | **2** | **11** | **14.23** | **12.61** | **2.284** | **18.1** |
| *Papio sp* | 10 | 8 | 12 | 10.22 | 1.263 | 12.357 |
| ***Papionin*** | **2** | **13** | **14.23** | **13.615** | **0.8697** | **6.38** |
| *Cercopithecus aethiops* | 8 | 5 | 7.9 | 6.5363 | 0.8658 | 1.2245 |
| *Colobus guezara* | 4 | 8.1 | 11 | 10.175 | 1.3961 | 13.7211 |
| *Mandrillus sphinx* | 2 | 8.2 | 9.7 | 8.95 | 1.0607 | 11.8509 |

**Morphological comparisons, quantitative analysis**

*a) The humerus- long axis of the medial epicondyle*

The long axis of the medial epicondyle observed in the Sterkfontein cercopithecoid assemblage suggests the presence of terrestrial to semi-terrestrial locomotor preference. The first group of specimens labelled as *Parapapio* sp (BP/3/23389, BP/3/24000, BP/3/3169, SWP 511, SWP 1176, SWP 1584, and SWP 4246) have a medial epicondyle axis which lies within the range of terrestrial and semi-terrestrial cercopithecoids, however, at a lower range than modern *Papio anubis* recorded in Harrison's (1989) study. All seven specimens have a medial epicondyle angle above 31°. The mean value for the epicondyle angle is 35°. The second group of specimens labelled as *Papio* sp (SWP 1165, SWP 1211, SWP 1262, SWP 1287, SWP 1540, SWP 4006 and SWP 4047) have a medial epicondyle with similar ranges. The third group, *Papio*/*Parapapio* sp (BP/3/23016, SWP 4041, SWP 1410, SWP 562, STS 377C, SWP 507, SWP 1140, SWP 995, SWP 995, SWP 912 and SWP 1016) have a mean angle of 30°. The fourth group consists of specimens classified as Papionin indet, (SWP 1543 and SWP 1583) which, morphologically could not be grouped with the other specimens. These two specimens have a medial epicondyle axis between 41° and 43°.

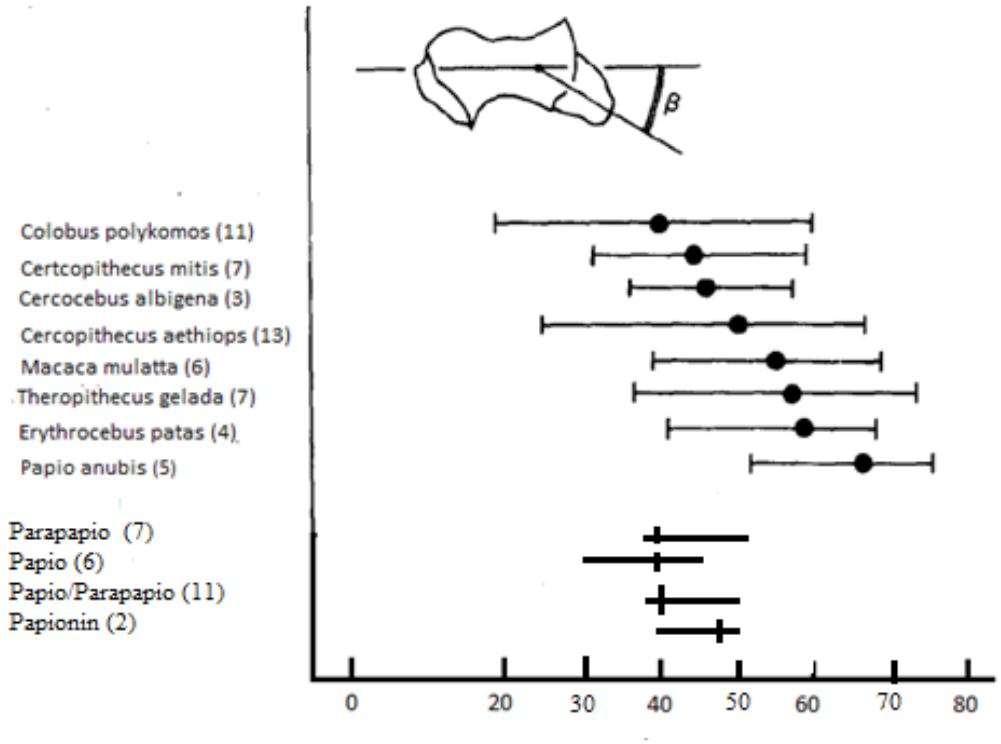


Figure 4.20. Angle of the medial epicondyle. Data on taxa follows Harrison, 1989.

b) *The humerus-relative breadth of the medial epicondyle*

The breadth of the medial epicondyle is demonstrated in Figure 4.20. Twenty three specimens are analysed. They are comparable to terrestrial locomotion observed in papionins. *Parapapio* specimens, (SWP 511, SWP 1137, SWP 1176, SWP 1584, SWP 2810 and SWP 4246) have a medial epicondyle breath with a mean of 9.2mm. The seven *Papio* specimens (SWP 1165, SWP 1211, SWP 1262, SWP 1287, SWP 1540, SWP 4006 and SWP 4047) have a mean breadth of 9.6. *Papio*/*Parapapio*'s mean is 7.5. The group consists of SWP 4041, SWP 1410, SWP 562, STS 377C, SWP 507, SWP 1140, SWP 912, SWP 1016 and SWP 4038. SWP 1583, which is the only specimen identified as Papionin indet., has a medial epicondyle breath of 7.8. This index is aligned to the ranges observed in *Papio*.

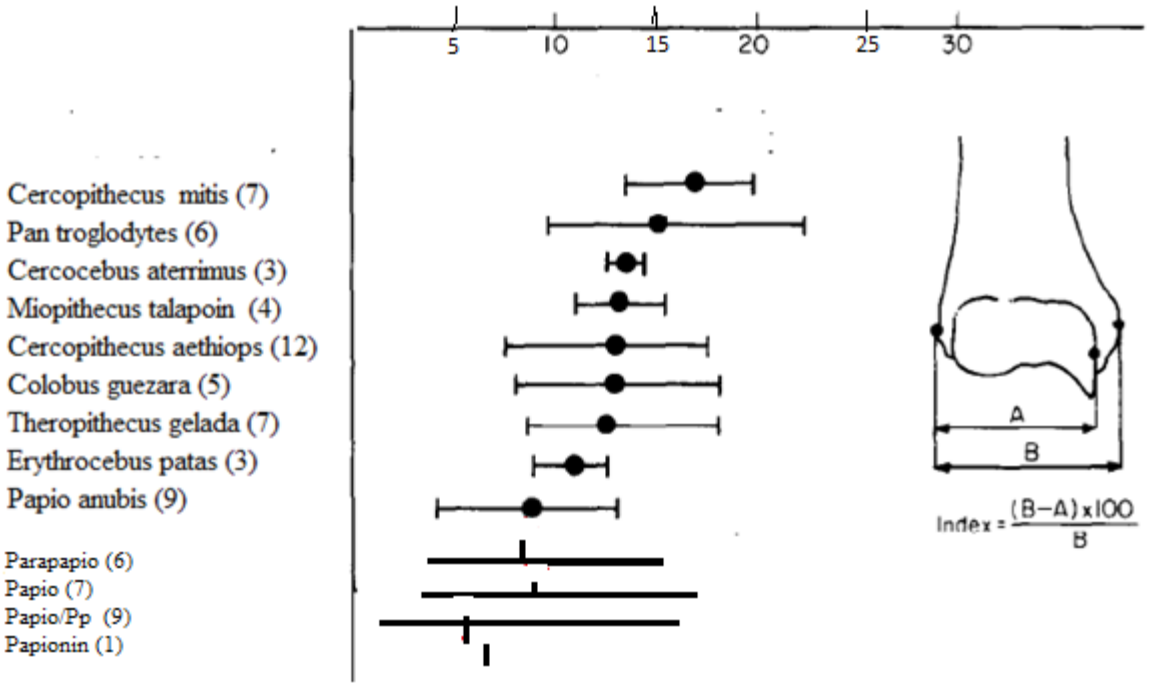


Figure 4.21. Relative breadth of the medial epicondyle. Data on taxa follows Harrison 1989.

c) *The radius- relative length of radial neck*

The specimens analysed for the relative length of radial neck index suggests proclivity to terrestrial to semi-terrestrially adapted locomotion. The *Papio* group consists of 10 specimens; BP/3/23453, SWP 1552, SWP 514, SWP 517, SWP 791, SWP 798, SWP 793, SWP 803, SWP 1418 and SWP 4042. The relative length of radial neck is consistent with cercopithecine radii index. Their mean ratio is very similar to Harrison's (1989) *Papio*, suggesting that they are within the range of terrestrial monkeys. *Parapapio* specimens (SWP 515, SWP 784, SWP 802, SWP 1204 and SWP 1219) which preserve a relatively longer neck, have a higher neck index of 51. They, however, do not fall directly within the range of colobines but display the same range as *Macaca*. The *Papio*/*Parapapio* class (STS unnumbered, SWP 516, SWP 519, SWP 520, SWP 792, SWP 799, SWP 808, SWP 972, SWP 979, SWP 1125, SWP 1306 and SWP 1416) has a similar head neck ratio as the first group of specimens. They have a mean ratio of 48.9 which is closer to *Papio* than to the colobines.

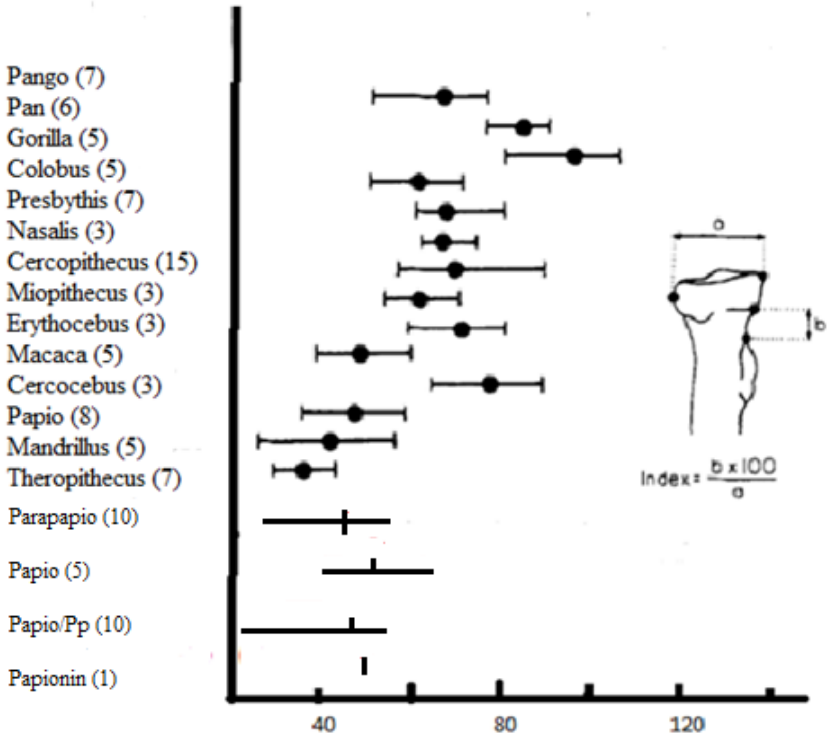


Figure 4.22. Relative length of radial neck index. Data on taxa follows Harrison 1989

### 4.1.3. **Quantitative analysis**

Qualitative observations are used as the basis for the statistical examinations. The results of the quantitative analysis are outlined through three analyses: a). Descriptive statistics are provided to illustrate variation present in the sample; b). The bivariate linear regression analysis points to correlation between morphological traits; and the Univariate Analysis of Variance (ANOVA) points to statistically significant differences among taxa.

### 4.1.4. Bivariate regression analysis

To assess the significance of the relationships between traits, bivariate linear regression analysis is applied to, five indices on the humerus and a couple of traits on ulna, the radius and the femur each.

a) Humerus

Six indices on the humerus were run through the bivariate regression analysis. Bivariate analysis for humeral distal articulation and maximum medio-lateral breadth of olecranon fossa (Fig 4.23) shows a strong positive relationship; r = 0.87. The anterior posterior length of humeral head and medio-lateral width of humeral head (Fig 4.24) suggests a strong positive correlation (r = 0.9) between the two traits. Data for the maximum proximo-distal length of olecranon and maximum medio-lateral breadth of olecranon (Fig 4.25) indicates a correlation (r) of 0.4 which suggests a weak positive statistical correlation. Bivariate analysis of the width of distal humeral articulation and bi-epicondylar width shows a strong positive correlation (r = 0.9) between the two traits. The fifth index, bivariate analysis of the fifth index, width of distal humeral articulation and width of distal trochlea (Fig 4.26) shows a strong positive relationship r = 0.9. Width distal humeral articulation and anterior posterior distal humerus (Fig 4.28) also have a positive correlation r=0.9.

Table 4.34. Legend for the bivariate regression linear plots.

| **Tribe** | **Colour** | **Symbol** | **Genus** |
|---|---|---|---|
| Colobines | red | dot | *Colobus* |
| | red | square | *Procolobus* |
| | red | open square | *Rhinocolobus* |
| | red | x (letter) | *Cearcopithecoides* |
| Cercopithecini | black | diamond | *Cercopithecus* |
| | black | star | *Chlorocebus* |
| Papionins | black | triangle | *Papio* |
| | black | inverted triangle | *Parapapio* |
| | black | Fill triangle | *Theropithecus* |
| | black | dash | *Mandrillus* |
| Papionins (Sterkfontein Fossils) | aqua | bar | *Papionin* |
| | aqua | triangle | *Papio* |
| | aqua | inverted triangle | *Parapapio* |
| | aqua | Fill inverted triangle | *Papio/parapapio* |
| | aqua | Fill triangle | *Theropithecus* |

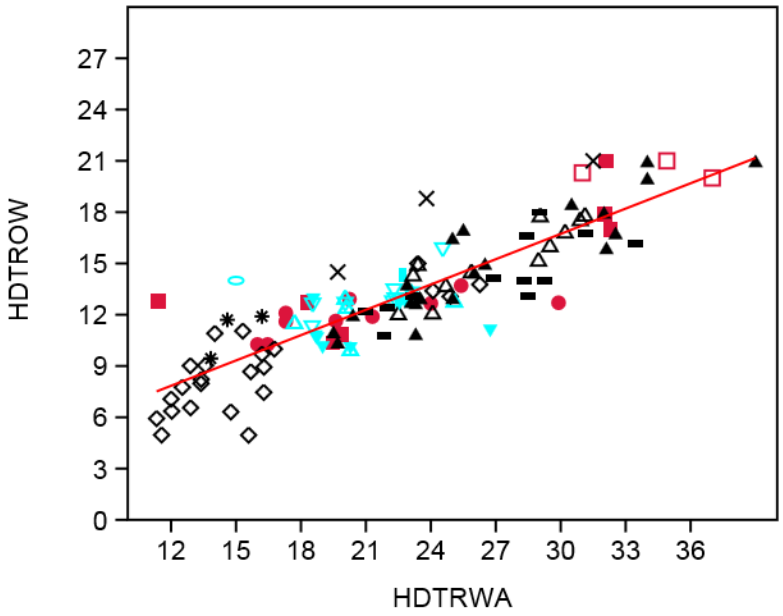


Figure 4.23. Linear plot for maximum medio-lateral width of olecranon fossa (HDTROW) and width distal humeral articulation (HDTRWA).

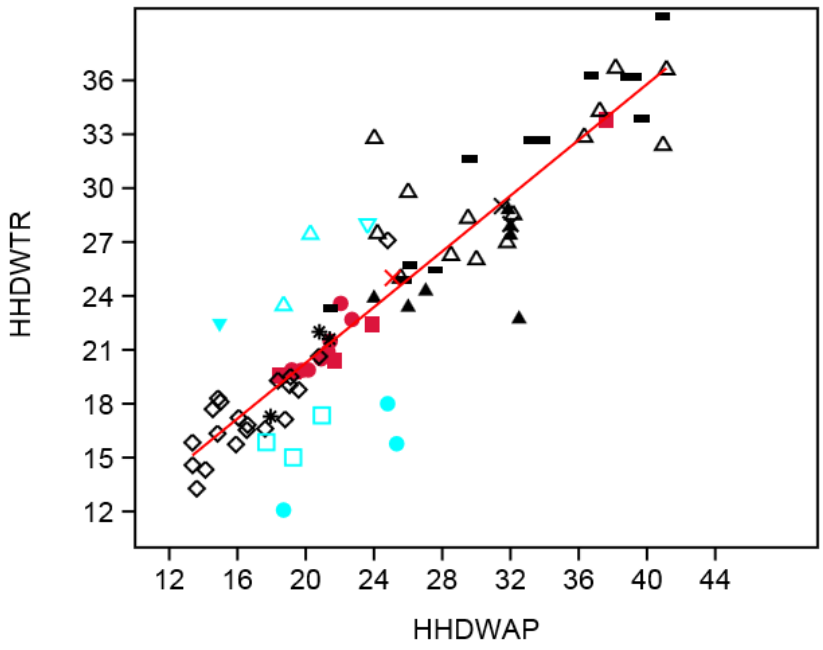


Figure 4.24. Linear plot for humeral head diameter/mediolateral width (HHDWTR) and humeral head anterior-posterior length (HHDWAP).

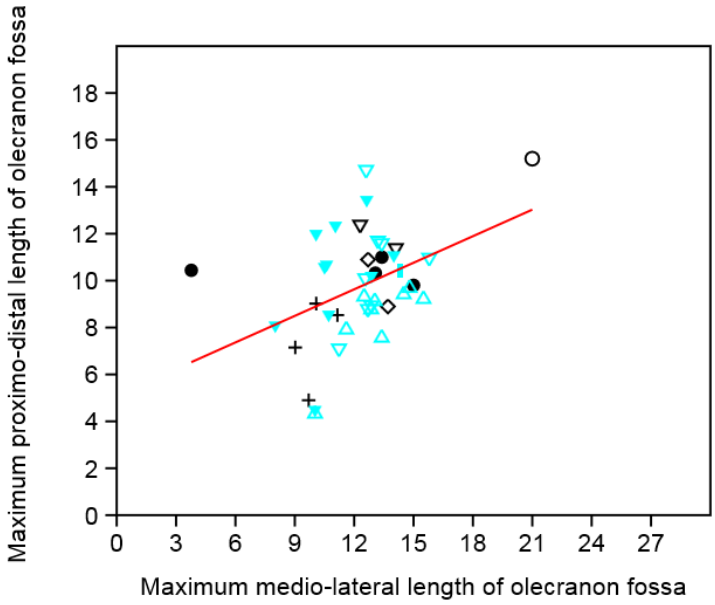


Figure 4.25. Linear plot for ‘maximum proximo-distal length of olecranon fossa and maximum medio-lateral length of olecranon fossa’.

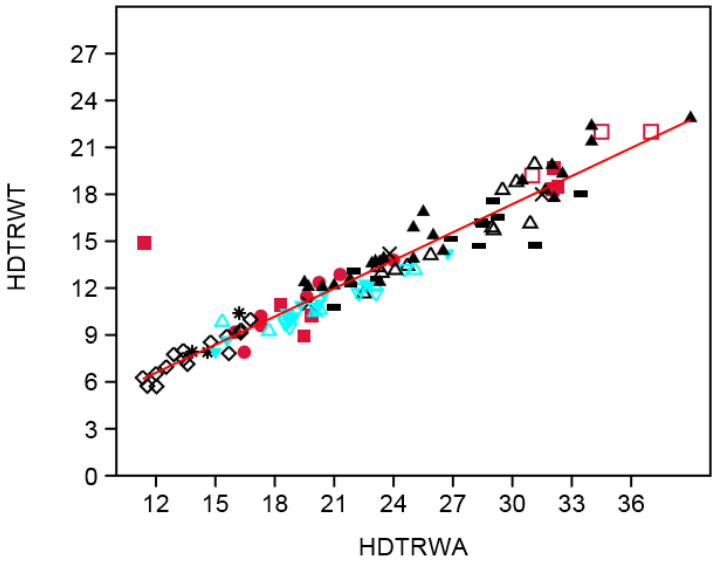


Figure 4.26. Linear plot for ‘width distal humeral articulation (HDTRWA) and width humeral trochlea (HDTRWT)’.

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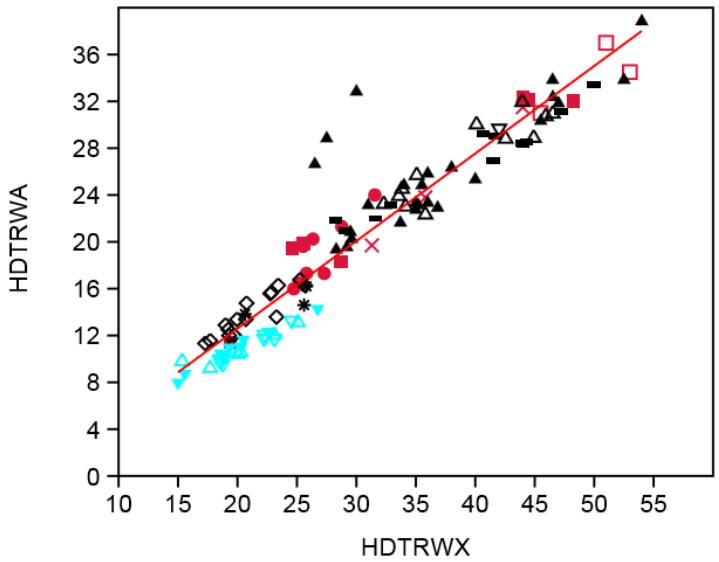


Figure 4.27. Linear plot for 'width distal humeral articulation (HDTRWA) and anterior posterior distal humerus (HDTRWX)'.

b)

c) Ulna

Bivariate regression analysis of the ulna proximo-distal height of olecranon process and antero-posterior length of olecranon process (Fig 4.28) shows a negative correlation (r =-0.3). Examination of the ulna proximo-distal height if olecranon process and trochlea notch height (Fig. 4.29) proved to have a negative correlation (r=-0.003)

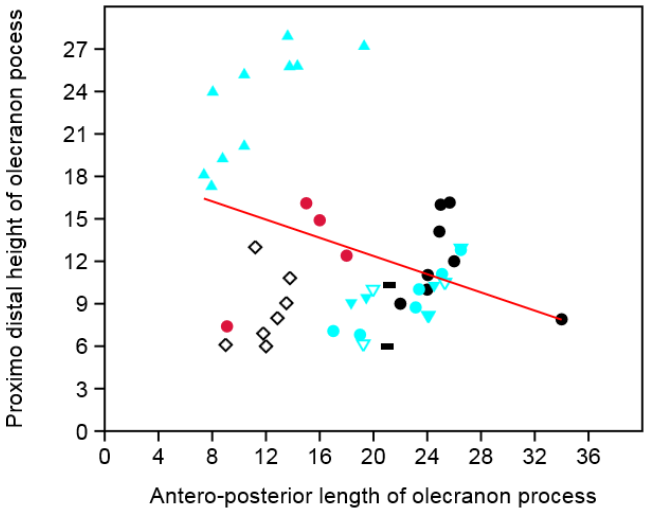


Figure 4.28. Linear plot for 'ulna proximo-distal height of olecranon process and antero-posterior length of olecranon process'.

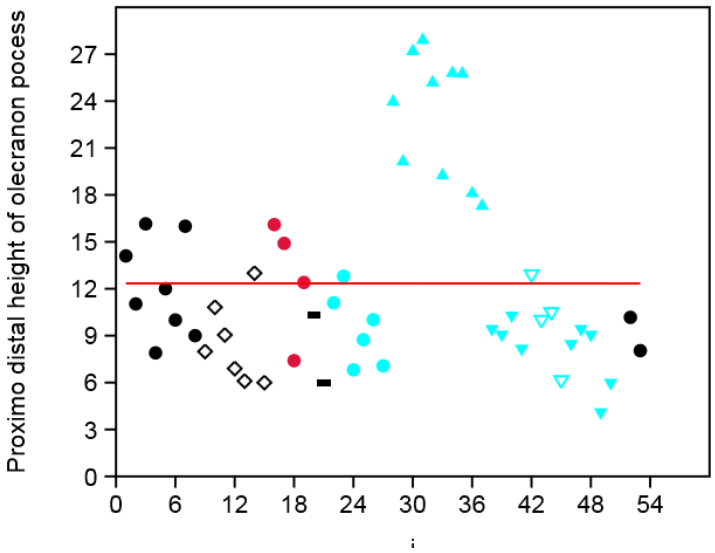


Figure 4.29. Linear plot for ‘proximo-distal height of olecranon process and proximo-distal height of trochlea notch’.

d) Radius

Regression analysis for maximum diameter of radial head and proximo-distal height of radial neck points to a modest positive relationship between the two variables. The maximum medio-lateral diameter of radial neck and anterio-posterior radius neck shows a positive correlation (Fig. 4.30).

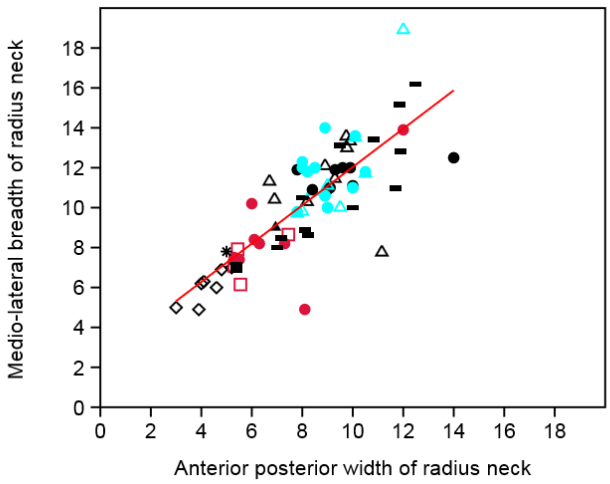


Figure 4.30. Linear plot for ‘maximum medio-lateral diameter of radial neck and anterior-posterior radius neck’.

e) Femur

Bivariate linear regression for femur anterior posterior length of femur head and medio-lateral breadth of femur head (Fig 4.31) shows a moderate positive correlation; r=0.6.

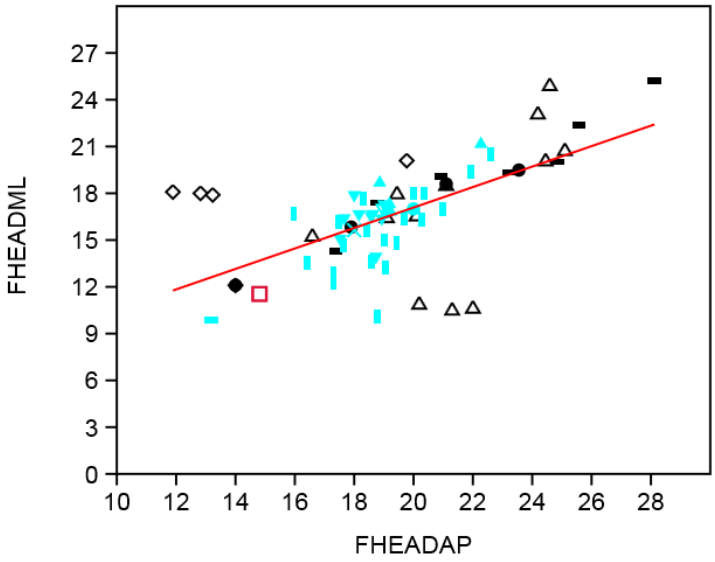


Figure 4.31. Linear plot for ‘femur anterior posterior length of femur head and medio-lateral breadth of femur head’.

Table 4.35 results of the ANOVA analysis

| Character Traits | Sum of squares | df | Mean Square | F | Siginicance |
|---|---|---|---|---|---|
| Maximum medio-lateral width of olecranon fossa (HDTROW) and width distal humeral articulation (HDTRWA) | 693.557 | 1 | 693.557 | 20.64 | 0.0002881 |
| Lateral epicondyle breadth to medial edge of trochlea and the medial trochlea flange length | 649.626 | 1 | 649.626 | 15.69 | 0.0001491 |
| Proximo-distal height of olecranon process and trochlea notch height | 102.43 | 1 | 102.43 | 4.312 | 0.0403 |
| Proximo-distal height of olecranon process and antero-posterior length of olecranon process | 649.626 1 | | | 15.69 | 0.0001491 |

4.1.5. Results of the Univariate Analysis of Variance (ANOVA). See Table 4.35.

a) Humerus

Five variables on the humerus did not yield positive results. No significant differences ($p>0.05$) were found for 1) head diameter, 2) olecranon width and height, 3) bi-epicondylar breadth; 4) humeral distal articulation and maximum medio-lateral breadth of olecranon fossa, and 5) humeral olecranon maximum medio-lateral width and olecranon maximum proximo-distal length.

The ANOVA test results suggest that two indices are statistically significant at $p<0.05$, the lateral epicondyle to medial edge of trochlea and the medial trochlea flange length and Maximum medio-lateral width of olecranon fossa and width distal humeral articulation.

b) Ulna

The ulna trochlea notch height and olecranon to anterior trochlea notch shows no statistical significance ($p>0.05$). ANOVA test results for olecranon proximo-distal height and olecranon anterior posterior length shows statistical significance ($p=0.0001$). The trochlea notch proximo-distal height and olecranon process proximo-distal height is statistically significant among the different genera ($p=0.04248$).

c) Radius

The radius neck proximo-distal height of neck and head and proximo-distal height of neck index did not demonstrate statistical significance ($p >0.05$) between genera. The radius anterior-posterior length and medio-lateral breadth of neck also did not prove to be statistically significant.

d) Femur

For the femur, significance ($p >0.05$) is not bserved for neck anterior-posterior length and neck medio-lateral breadth. Femur anterior posterior length of femur head and medio-lateral breadth of femur head proved not to have statistical significance ($p>0.05$).

## 4.3 Conclusions on the systematic palaeontology of the fossil cercopithecid postcrania of the Sterkfontein Caves

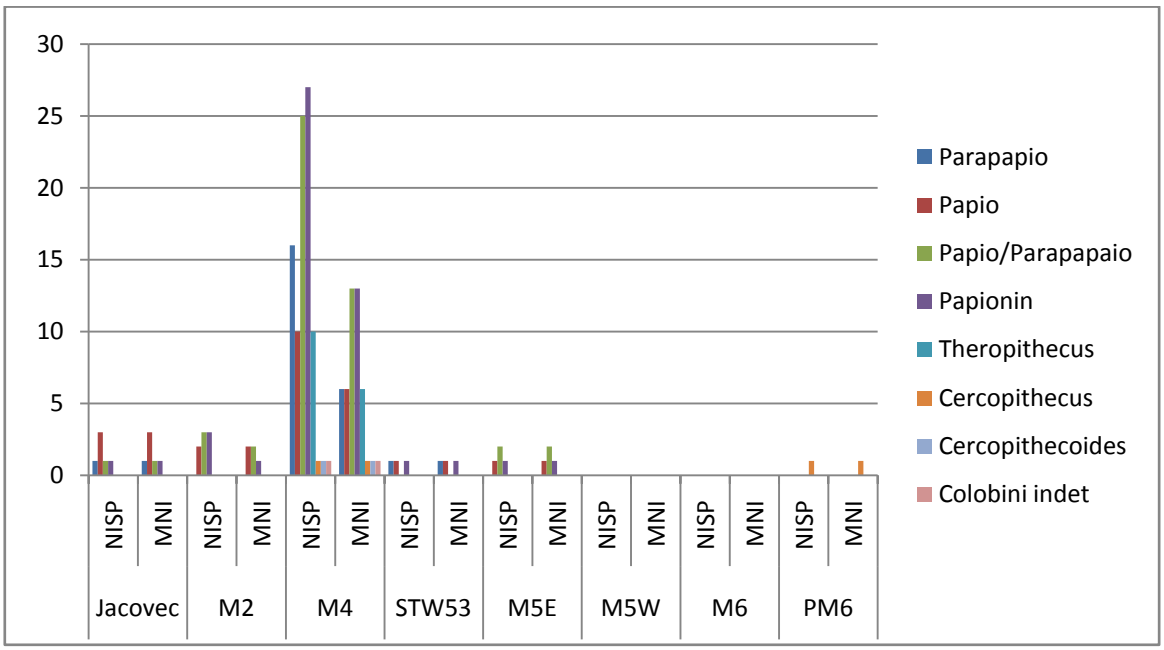


Figure 4.32. Sterkfontein caves and Number of Identified Specimens (NISP) Minimum Number of Individuals (MNI) by taxa per deposit.

Qualitative analysis of the sterkfontein postcrania indicates that the four limb bones, the humerus, the ulna, the radius and the femur can be used to distinguish between taxa. The following traits proved to be significantly different on, the humerus, the extension of the greater trochanter distinguishes between *Parapapio* and *Cercopithecus* and *Papio*. Distally, comparisons of the shape of the olecranon fossa suggest differences between the same two groups. Variation at species level could not be ascertained from all fossil skeletal elements under study.

Statistical assessment of all but one of the humeral traits could not distinguish between taxa. Therefore the humeral epiphyses are weak indicators for taxa among the family Cercopithecoidea. From the results of this analysis it can be assumed evident that the humerus bears little taxonomic signals in primate cercopithecoid genera. Examination of

most of the morphological traits of the ulna show the olecranon proximo-distal height and olecranon anterior posterior length and the trochlea notch proximo-distal height and olecranon process proximo-distal height are positive indicators for genera and are statistically significant.

More statistically significant traits observed are on the radius and the femur. The radius neck supero-inferior length and the radius neck and head length index suggest statistical significance. The same significance applies for the radius neck, based on the antero-posterior width and medio-lateral width index. The femur antero-posterior length of head and medio-lateral breadth of head width did not show statistical significance among the different genera.

From the quantitative morphological analysis it is evident that the radial neck (neck height versus neck and head height, and neck antero-posterior width versus medio-lateral breadth) and the femur head (anterior-posterior head length and medio-lateral head width) can be used to discriminate between cercopithecoid genera.

### 4.3.1. *Form, function and size of the fossil cercopithecoid postcrania of the Sterkfontein Caves*

Research on postcrania remains has demonstrated its applicability to provide information on cercopithecoid locomotion (e.g. Elton 2000, 2001). In cercopithecoids, the difference in the proximal and distal humerus, proximal ulna, and proximal femur have proven to yield significant information on the locomotor habitus (Harrison 1989; Hlusko 2007).

This study has supports research which argues that that functional adaptation and morphology does not necessarily, always, translate to taxonomy. The results of the taxonomic analysis indicate that anatomical form is not the best discriminator between various taxa. On the humerus, the humeral greater tuberosity extension does not discriminate at any taxonomic level. The level of greater tuberosity superior projection of the greater tubercle varies among members of the same family and tribes, and the trait is also shared among various genera and locomotor groups. The elevated greater tuberosity serves to restrict movement at the gleno-humero joint, a feature seen in more terrestrially adapted cercopithecids (Jolly, 1967; Harrison 1989). Terrestrially (and semi-terrestrial) adapted

morphology and locomotion is known in papionins (*Papio, Theropithecus*), Cercopithecines (*Cercopithecus aethiops*) and in fossil Colobines (*Cercopithecoides williamsi*, *Cercopithecoides kimeui*). However, within this locomotor group, morphological and size differences are discernable. The humeral head shape varies between the cercopithecines, papionins and colobines. Cercopithecines have a hemispherically (proximo-distally compressed) shaped head compared to old world monkey whose humeral heads are more proximo-distally elongated (oval) on anterior view. The medial epicondyle is more retroflexed in *Papio and Cercopithecines* than in the colobines. The olecranon fossa shape has also proved not to have any discriminatory properties. On the ulna, the extension of the olecranon process varies between arboreal forms and terrestrial forms. The olecranon in arboreal colobines is short and is not retroflexed while terrestrial papionins such as *Papio*, have a longer and retroflexed olecranon.

Size is an important discriminatory factor in taxonomic analyses. Various studies (e.g. Gingerich 1981; Conroy 1999; Spoctor & Manger 2007; Sears *et al*, 2008) have been undertaken which estimate body mass based on cranio-dental data. Postcranial skeletal element sizes, particularly in adult individuals, are a better approximation of body mass (Payseur *et al.* 1999). They have a close association with body size and mass. Descriptive statistics, demonstrate numerous overlaps in size between different genera but groups according to body size or mass. As a result, and as seen in this study, size is one of the elements which can be utilised to discriminate between possible taxonomic groups. However, size in isolation, has not proved to be useful as a distinguishing variable in taxonomic studies.

Form, function and size are important factors in taxonomic studies. They play a major role in taxonomic examinations; however, they cannot be treated as disconnected facets of a taxonomic exercise. Each plays an essential role in taxonomic analyses.

## 4.4 Fossil cercopithecoid taxa identified per deposit within the Sterkfontein Caves

Taxonomic groups identified within the Sterkfontein Cave infills demonstrate variability over time. The Silberberg Grotto preserves the same taxonomic groups (mainly Papionins) as those identified within the Member 4 deposit; however, Member 4 preserves more taxonomic diversity than the older Silberberg Grotto and Jacovec Cavern. Primate taxa are drastically reduced in the deposits younger than Member 4.

### 4.4.1. *Jacovec Cavern*

The Jacovec Cavern is the deepest fossil-bearing deposit in the cave system, but is one of the least fossil-yielding deposits (Wilkinson 1973; Kibii 2000). The possible causes are discussed in the taphonomy section in Chapter 5.

Only papionins are taxonomically identified in the Jacovec Cavern. Fourteen specimens represent these papionins. Five *Papio* individuals are present in the cavern. There is also a small and a medium sized *Papio*/*Parapapio* as well as two specimens which could only be identified to the tribe papionini. The morphological analysis has demonstrated that these fossil *Papio* specimens are very similar to modern *Papio*. The morphology is consistent with terrestrial locomotion.

The small to medium sized fossil *Papio* specimens discovered in this infill display terrestrially adapted morphology. They demonstrate an upper arm and a stable shoulder joint restricted in the saggital plane. The morphology and size (particularly of the medium specimen, BP/3/23257) does not deviate from the modern *Papio* anatomy. They have similar morphology and are comparable in size.

The small and medium *Papio* species identified, based on fossil cercopithecoid postcrania in the Jacovec Cavern mixed breccia, correspond to Kibii's (2000) conclusion that *Papio izodi* is present in the assemblage. *Papio izodi* was a medium sized primate; therefore, there is likelihood that the two *Papio* individuals identified in this study are *Papio izodi*.. *Papio izodi* demonstrates affinities towards a more primitive form and towards *Parapapio broomi*

(McKee 1993). Morphologically these resemble the humerus UCMP 125858 (which is identified as *Papio izodi*) identified from taung by Gilbert *et al*, 2016.

The medium sized *Papio/Parapapio* specimens identified within the deposit cannot be linked to cranio-dental *Parapapio* specimens. The medium *Pp. broomi* identified within Jacovec demonstrates different morphological traits to modern *Papio (*Kibii 2004). The only link that the *Parapapio broomi* mandible has with the postcrania in the *Papio*/*Parapapio* category is the medium size. This is not sufficient data to infer correlations between the two specimens. The Sterkfontein *Parapapio* forelimb shares some affinities with *Parapapio jonesi* from Hadar as described by Frost and Delson (2000). No other comparative postcranial material from this species or other fossil monkeys occurring in southern or East Africa exists. Therefore the materials are assigned to *Parapapio* sp. Taxonomic conclusions derived from cercopithecoid postcrania correspond to cranio-dental taxonomic data recorded by Kibii (2004) which suggest the dominance of papionins within the deposit. Kibii (2004) also identified a colobine which is not identified postcranially.

### 4.4.2. *Silberberg Grotto*

Papionini dominate the Member 2 fossil cercopithecoid assemblage. These are represented by small and medium sized *Parapapio* and *Papio* as well as large papionins. The taxa and the associated morphology of the Silberberg Grotto fossil cercopithecoids remains are similar to the Jacovec cercopithecoids. However, the average individual size within the Silberberg Grotto is medium. When considering cranio-dental data, the Silberberg Grotto fossil cercopithecoids demonstrate more taxonomic diversity than Jacovec Cavern. This is probably due to the much smaller sample size from the Jacovec Cavern thus far.

The Silberberg Grotto preserves *Cercopithecoides williamsi*, *Parapapio broomi*, *Parapapio jonesi* and *Papio izodi* (Pickering *et al.* 2004a). Jacovec Cavern has yielded remains of *Parapapio broomi, Parapapio jonesi* and *Papio izodi* and an unidentified colobine. No *C. williamsi* has been recorded from Jacovec, although this is an uncommon taxon overall at Sterkfontein. The morphology of the fossil cercopithecoid remains does not vary from the Jacovec specimens. The link between the *Papio* and *Parapapio* postcrania and the fossil

species identified in the cranio-dental material cannot be ascertained by the current study. *Australopithecus* is the only hominid genus discovered within both deposits.

The similarity of the taxa preserved within the Silberberg Grotto and the Jacovec Cavern suggests comparable palaeoenvironmental conditions during accumulation. However, Member 2 has a high predominance of primates and felids. The two common morphological features between these two taxonomic groups are the similar body sizes and their agility. Felids and primates are agile animals and their equivalent frequency in the Silberberg Grotto is likely to be related to this factor, in contrast with bovids that occur in lesser frequencies within the deposit. The closed wooded environment in which these taxa co-existed in such large numbers was suitable for their dominance. Pickering *et al.* (2004a: 279) state that the Member 2 palaeoenvironment was characterised by 'rolling, rock-littered and brush- and scrub-covered hills' with some tree cover--the sort of environment which supports agile body forms. Kibii (2004) suggests that Jacovec Cavern had a mosaic of open and closed habitats with a riverine gallery forest. On average, however, the number and percentage of small individuals is less in Member 2 compared to Jacovec Cavern, which has higher frequencies of small sized cercopithecoids. The latter environment is reconstructed as relatively open, with a permanent water supply in the vicinity (Pickering *et al.* 2004a).

4.4.3. *Member 4*

Member 4 preserves more taxonomic diversity in fossil cercopithecoid postcrania. *Papio*nins disproportionally dominate the assemblage with an NISP of 242, which constitutes 92 % of the total NISP of identified taxa and 23% of the Member 4 fossil cercopithecoid postcrania assemblage. The papionins identified are similar to Member 2 papionins; these are *Parapapio*, *Papio*, and an unidentified papionin. *Cercopithecus aethiops* is present in the deposit. The tribe Colobini as well as the most common and large colobine in the southern African fossil deposits, *Cercopithecoides,* also form part of the assemblage. The *Parapapio* and *Papio* sizes range from small to large. There are indeterminate *Theropithecus* individuals in the deposit identified from postcranial remains.

The morphology of the papionins identified within the Member 4 assemblage point to a suite of characters. The Sterkfontein fossil *Parapapio* upper arm is flexible with rotational

abilities while retaining terrestrial tendencies in the hind limb. The East African *Pp. ado* is highly terrestrial in nature; however its shoulder joint preserves anatomy which is more arboreally inclined (Jablonski *et al.* 2008), a feature similar to South African *Parapapio.* Based on the limited nature of *Parapapio* postcrania fossil remains in the East African context, this data is used with caution. Studies of East African *Parapapio ado* suggests that the species had a generalist-type of locomotion with most of its time spent on the ground (*ibid.*). The relationship between the South African *Parapapio* and the East African *Pp. ado* is currently unclear. However, morphological and quantitative analysis of the Sterkfontein *Parapapio* suggests that the genus is similar to the East African variant of the genus.

Cranio-dental data has not revealed *Theropithecus* within Member 4. *Theropithecus* postcranial specimens in the deposit represent robust medium to large individuals. Delson's biochronology (1984) study suggests that Member 4 is a zone occupied by *Theropithecus darti, Theropithecus brumpti, Cercopithecoides williamsi, Parapapio* and *Papio hamadryas robinsoni*. However, not all these species are represented at Stekfontein. *Theropithecus darti* is identified in Makapansgat Members 2, 3 and 4 (Freedman 1965; Maier 1970). Makapansgat Member 2 is dated by faunal correlation to 3.2-2.7 My (Reed 1997; Tobias 2000), palaeomagnetism dates suggest that Member 3 and 4 are 3.03 -2.58 My (Partridge 1979). The presence of *Theropithecus* in the Member 4 landscape is highly plausible and a lack of recorded cranio-dental materials could be due to factors other than its absence from the Sterkfontein environment (i.e., sampling or taphonomic issues)during the accumulation of Member 4. This genus was identified by Ciochon (1993) within the Member 4 fossil cercopithecoid postcranial sample. He identified remains of *T. darti*, although this study questions these identifications. *Theropithecus oswaldi* in Sterkfontein is also identified by T.R Pickering in Member 5.

*Cercopithecoides* identified in the Sterkfontein deposits is a medium-sized individual. Von Mayer's (1999) assertion that Sterkfontein Member 4 *Cercopithecoides* is a small variant of the genus, adapted to woodland environments, cannot be corroborated by this study. The upper arm of this species suggests a terrestrially inclined fossil monkey, particularly in the forearm; its femur suggests it had a flexible hind limb joint, although movement was restricted to the sagittal plane. The specimens are slightly smaller than the *C. williamsi*

Koobi Fora specimen; however, they are similar in size to the Laetoli specimen which is a *Cercopithecoides sp*. Only two specimens are assigned to *Cercopithecoides*, therefore statements on this genus' postcrania in the Sterkfontein caves are tentative.

The presence of *Parapapio,* a generalist herbivore (and *Parapapio jonesi* which subsisted on a mixed diet consisting of grasses, leaves and fruits) suggests that they existed in a mosaic of open and closed wooded environments (El Zaatari *et al.* 2005, Jablonski & Leakey 2008). Hatchett (2011) states that *Theropithecus* relied on a $C^4$ diet which it supplemented with fruits and leaves. Member 4 and the Member 5 East infill indicate the presence of a wooded to moderately wooded environment until about 2.0-1.8 My (Luyt & Lee-Thorp 2003). Data indicate a shift to open environments with the accumulation of the Member 5 West infill (*ibid*.). The terrestrial habitat preference of *Papio* and *Cercopithecoides* support the presence of an open environment near to the forested valley. The extreme terrestrial nature of *Theropithecus* and the domination of terrestrial papionins over colobines in Member 4 point to the existence of an open grassland near to the caves at the time of accumulation of the deposit. The presence of arboreal primates also suggests there was some tree cover in the Sterkfontein valley area during the Member 4 period.

Papionins constitute 92 % of identified taxa within the Member 4 assemblage. When cranio-dental specimens are also considered, data still indicate that papionins dominate colobines. 95% of individuals within the deposit are papionins, compared to 5% colobine individuals (Kibii 2004). This relates to an environment conducive to their complex social structure and the reproductive success of the papionins in the African Plio-Pleistocene. The lack of abrupt changes in the taxa between Members 2 and 4 is noteworthy. The similarity of papionins identified in this deposit to the Silberberg papionins suggests some continuity between these two deposits.

#### 4.4.4. *StW 53*

The difference in the taxonomic content of the Member 5 deposits suggests that the StW 53 infill is unique from the other two infills. The StW 53 deposit has been suggested to be a probable later phase of Member 4 (Kuman & Clarke 2000). The presence of *Theropithecus* and a colobine in StW 53, which are also found in Member 4 and the Oldowan infill and not

in Member 5 West, suggests a relationship between Member 4 and StW 53. The Member 5 West deposit and its taxonomic composition of papionins differ from the latter's taxonomic pattern. The apparent decline of primate frequencies between Member 4 and the StW 53 deposit partially supports that conclusion, although the StW 53 infill is a very small deposit. The presence of an *Australopithecus* in that latter infill which is similar to the ones identified in Member 4. Clarke (2013) points this to be a deposit different from the rest of Member 5.

#### 4.4.5. *Oldowan Infill*

The only recorded taxon from the Oldowan infill fossil cercopithecoid postcranial assemblage is a *Papio* specimen which resembles modern *Papio ursinus* in morphology. The Member 5 deposits preserve the *Papio/Parapapio* specimens. The likelihood of *Parapapio* occurring during the accumulation of this deposit is very low as *Parapapio* possibly occupied a mosaic of a closed environment with some open habitats (El Zaatari *et al.* 2005), which are more associated with earlier deposits. Therefore the likelihood that the specimens identified as *Papio/Parapapio* are *Papio* is high. The fragmentary nature of these specimens hinders conclusive taxonomic assignment to either genus.

#### 4.4.6. *Member 5 West*

These deposits also demonstrate a radical reduction in fossil primate quantities. The low primate numbers in these deposits is attributed to the changing environment after 1.7 Ma, which saw the decline in primate variability in the fossil record.

#### 4.4.7. *Member 6*

Within the Member 6 deposit only the cercopithecoid family is identified and these are not identified to tribe. The Member 6 deposit primate assemblage is very small. The two cercopithecoid postcranial specimens in the deposit have not been identified to taxa.

### 4.4.8. *Post Member 6 deposit*

The Post Member 6 assemblage retains some of the *Papio*nin taxa identified within the earlier deposit, albeit at a reduced scale, which is expected, due to the changing environment during the accumulation of this deposit. The deposit preserves a very small range of primates and as a result few taxa are represented. A small *Cercopithecus* as well as a small *Papio* individual are identified. Taxonomic identification of the Sterkfontein fossil *Cercopithecus* specimens was based on modern comparative materials which are assigned to the genus *Cercopithecus.* Further examination of the humerus and the radius specimens could not be assigned to species level. According to the literature, the species *aethiops* has been moved to *Chlorocebus* and the genus *Cercopithecus* is still under revision. The genus *Cercopithecus* is still a valid genus. For purposes of this thesis, the Sterkfontein fossil specimens are identified only to genus level. The relative prominence and sudden appearance of the small bodied *Cercopithecus* in the Post Member 6 assemblage is likely a factor of the changing cave structure Reynolds *et al.* (2007) report an increase in small carnivores in the younger deposits (Member 6, Post-Member 6 and Lincoln Caves) of Sterkfontein. After the deposition of Member 5, the cave entrance was too low. (Ogola 2009) suggests that carnivores could have been able to access, and accumulates bone into the cave. This correlates with the increase in small monkeys, particularly the cercopithecines, observed in the cercopithecoid assemblage.

# CHAPTER FIVE

# RESULTS: TAPHONOMY OF THE STERKFONTEIN FOSSIL CERCOPITHECOID POSTCRANIA

The Sterkfontein non-hominid fossil primate post-crania assemblage examined in this study consists of 1514 identified specimens (NISP). Appendix A provides a detailed list of the skeletal elements from each deposit. Femora constitute the most identified skeletal element at 29% of NISP, while only four carpals were identified in the whole assemblage constituting 0.2 % of the NISP. In all skeletal elements, shafts constitute the most identified anatomical parts while distal portions are the least. This chapter provides the taphonomic descriptions and analysis, but detailed interpretations are presented in Chapter Seven.

## 5.1. Jacovec Cavern

Jacovec cavern preserves 12% (NISP: 181) of the total Sterkfontein non hominid primate postcrania assemblage. One hundred and fifty seven elements are identified, constituting a high NISP:MNE ratio. All skeletal body parts are represented in the assemblage; extremeties are the highest represented in terms of NISP and MNE (Fig. 5.1). Phalanges and metapodials have a combined NISP (54) which is 29% of the total Jacovec NISP, and 33% of total MNE.

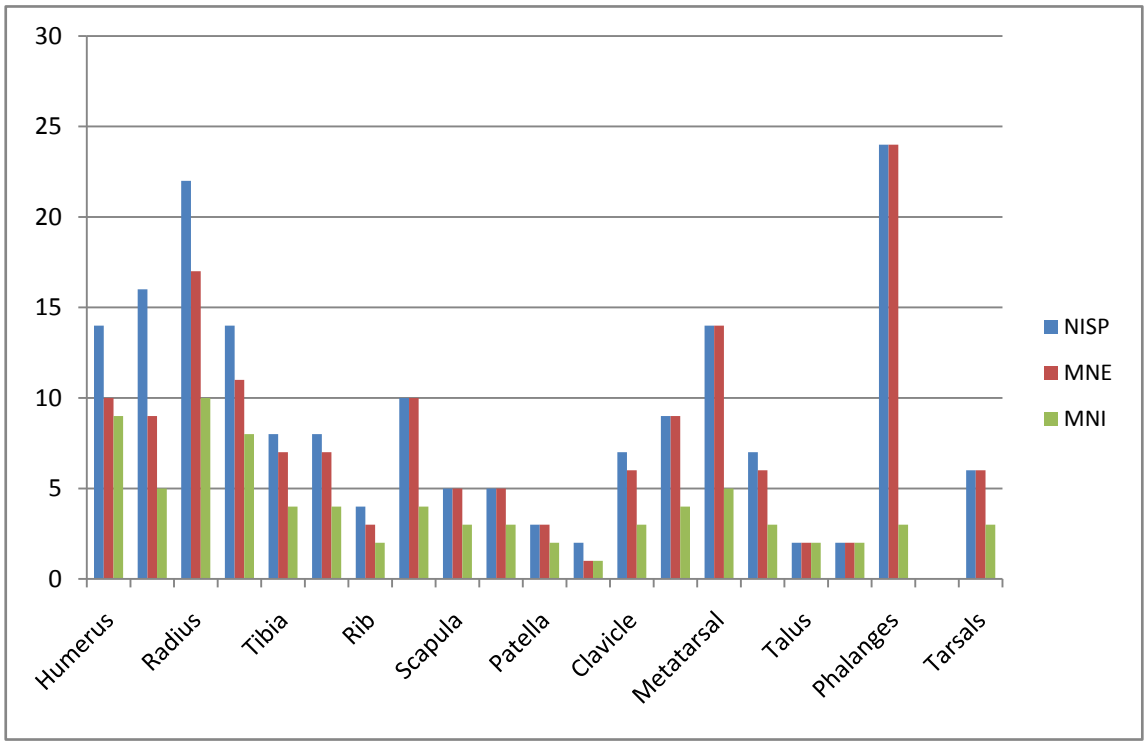


Figure 5.1. Jacovec Cavern fossil cercopithecoid postcranial skeletal element frequencies.

Fore limbs dominate in terms of the minimum number of individuals preserved and they consitute the second largest proportion of preserved NISP. The largest MNI within the fore limb category is represented by the radius. Radii suggested the presence of at least ten individuals. These are: one medium sized juvenile represented by a proximal left radius (BP/3/31553); five medium sized adults are represented by two right proximal radii (BP/3/23235 and BP/3/31923); two radii shafts (BP/3/22494 and BP/3/31388) as well as additional five radius shafts (BP/3/22575, BP/3/23232, BP/3/23715, BP/3/31354 and BP/3/31382). Four small sized individuals are represented by two left proximal radii (BP/3/22613 and BP/3/23453) two left radii shafts (BP/3/22456 and BP/3/31922) and three more unsided shafts (BP/3/22660, BP/3/23191 and BP/3/23237). In addition there is a small juvenile individual (BP/3/22456), a small sub-adult (BP/3/31661) and a medium sized sub-adult (BP/3/31691). The hind limb suggests there is an additional individual, a a large adult represented by a left proximal tibia (BP/3/22520).

The age distribution of the elements preserved also suggests a normal distribution of a primate community. When assessing the age distribution within the Sterkfontein fossil cercopithecoid postcrania asssemblage using radii, adults constitute 90% of the MNI population, juveniles constitute 10% of the MNI and there are no sub-adult radii preserved. The size distibution also suggests the same trend. Sixty percent are medium sized individuals (MNI) and 30% are small sized individuals. The dominant percentage of preserved skeletal element portions per NISP are shafts and proximal portions are the least preserved. Only seven percent of the specimens could be identified to genus level.

The pattern of skeletal element representation in the Jacovec Cavern is unlike the other deposits. The domination of fore limbs, phalanges and podials over hind limbs is peculiar as the general pattern observed within other deposits is that hind limbs are preserved in greater quantities compared to fore limbs. Extremeties are the smaller skeletal elements. This scenario suggests movement of skeletal elements into the cave. Tumbling and surface slopewash of bones into this cavern are suggested by the high representation of extremities and the presence of abraded and trampled specimens preserved in the assemblage.

During the slump of the brown breccia talus, all the smaller juvenile primates as well as a large percentage of the fossil cercopithecoid specimens were washed and tumbled into the cavern floor where admixture of materials from the brown and orange breccias ocurred. Kibii (2004) suggests that various processes played a role in the accummulation of the Jacovec Cavern skeletal remains. Carnivore modification marks, combined with evidence of tumbling, suggests that the assemblage was impacted by carnivores and only later tumbled into the deposit (Kibii 2004). The hominid material, along with some cercopithecoids, was accumulated in the cave through water action during deposition of the (earlier) orange breccia. The majority of the monkeys was washed in during the accummulation of the younger brown breccia. The absence of hominid remains during the depositition of the brown breccia could suggest that the hominids may not have been active around the vicinity of the cave, compared to the earlier stage when the orange breccia formed.

## 5.2. The Silberberg Grotto

All materials from the Silberberg Grotto (Members 2 and 3) included in this study are from Dump 20. The assemblage is the third largest fossil cercopithecoid primate postcrania assemblage in the Sterkfontein deposits after Member 4 and Jacovec Cavern. It preserves 9% (NISP: 137) of the Sterkfontein fossil cercopithecoid postcrania assemblage. Materials from this dump contain a full range of skeletal parts, including limbs, parts of the axial skeleton and extremities (Fig. 5.2). It even preserves one set of articulating distal humerus with a proximal ulna (SWP 1585). Limbs dominate the assemblage at 78% of the postcranial NISP. The femur is the dominant skeletal element; it is 40% of the Silberberg fossil cercopithecoid postcrania. This is followed by the humerus at 16% of the Member 2/3 NISP.

A minimum of 14 individuals is represented in this assemblage. There is a small juvenile individual represented by a humerus (SWP 1588), while the femurs suggest a minimum of 13 individuals: one small adult (SWP 1617), two large individuals (SWP 1534, SWP 1605), one medium juvenile (SWP 1367), one medium sub-adult (SWP 1697) and 15 medium adults represented by ten left proximal femora (SWP 1?85, SWP 1385, SWP 1414, SWP 1537, SWP 1612, SWP 1698, SWP 1699, SWP 1700, SWP 1705, SWP 1709).

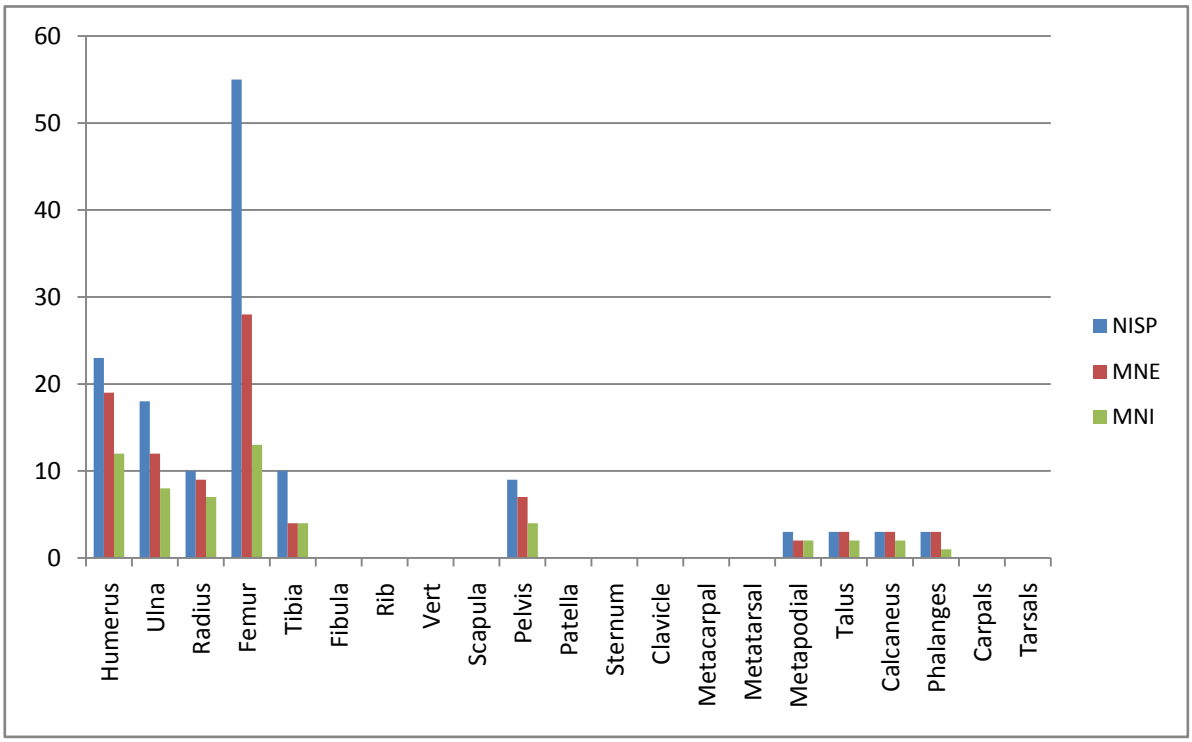


Figure 5.2. Silberberg Grotto fossil cercopithecoid postcranial skeletal element frequencies.

The Silberberg Grotto cercopithecoid materials are missing much of the postcranial axial skeletal elements; however, cranio-dental materials are well represented. The state of preservation of the in situ Member 2 fossil assemblage, as reported by Pickering et al. (2004a), indicates that the fossil primates are represented by a full range of skeletal elements. Although some of the materials from Dump 20 could possibly derive from Member 3, the general pattern is still consistent with the materials from the in situ Member 2 excavations.

The high frequency of fossil cercopithecoid remains with a full range of skeletal elements preserved, articulated fossil cercopithecoid and hominid specimens, as well as the large numbers of carnivores within Member 2/3 strongly suggest a death trap as a mode of accumulation. This situation suggests that the Member 2/3 fossil faunal assemblage accumulated as a result of an aven scenario where animals accidentally fall down a shaft in a closed environment and are trapped within the cave (Pickering *et al*. 2004a).

Femora are highly fragmented and are the most represented skeletal elements in the dump. Twenty-eight femoral elements are represented by 55 specimens. It is the only element within the dump with an average ratio of 1:2. The average NISP: MNE ratio within the dump is less, at 1:1.5. Therefore, representation of the femur is exaggerated due to fragmentation. The proximal and distal portions of the femur are also highly represented. Sampling is a likely causal factor for this phenomenon. The dump material derives from lime mining operations.

Pickering et al. (2004a) suggest that the deposit gathered as a result of different death trap scenarios. Both hominids and cercopithecoids are agile animals that could have entered the cave through an accidental, either being killed in the fall or being unable to exit. Both the Australopithecus skeleton (ibid.) and the fossil cercopithecoid remains are, in some cases, represented by articulating skeletal parts, which confirms the deathtrap scenario.

### 5.3. Member 4

This assemblage contains the largest number of identified specimens and individuals within the Sterkfontein fossil non-hominid primate postcrania (Fig. 5.4). It preserves 67% (NISP: 1013) of the Sterkfontein fossil Cercopithecoidea postcrania assemblage. A significant percentage (39%, NISP: 400) of specimens in the Member 4 assemblage are derived from the associated dumps and 292 (28% of NISP) of these are from Dump 13. Dump 18 has the second largest NISP (48) and Dumps 10 and 12 preserve the least at 10 specimens each. Forty-three specimens (4% of Member 4 NISP) are from the Type Site locality.

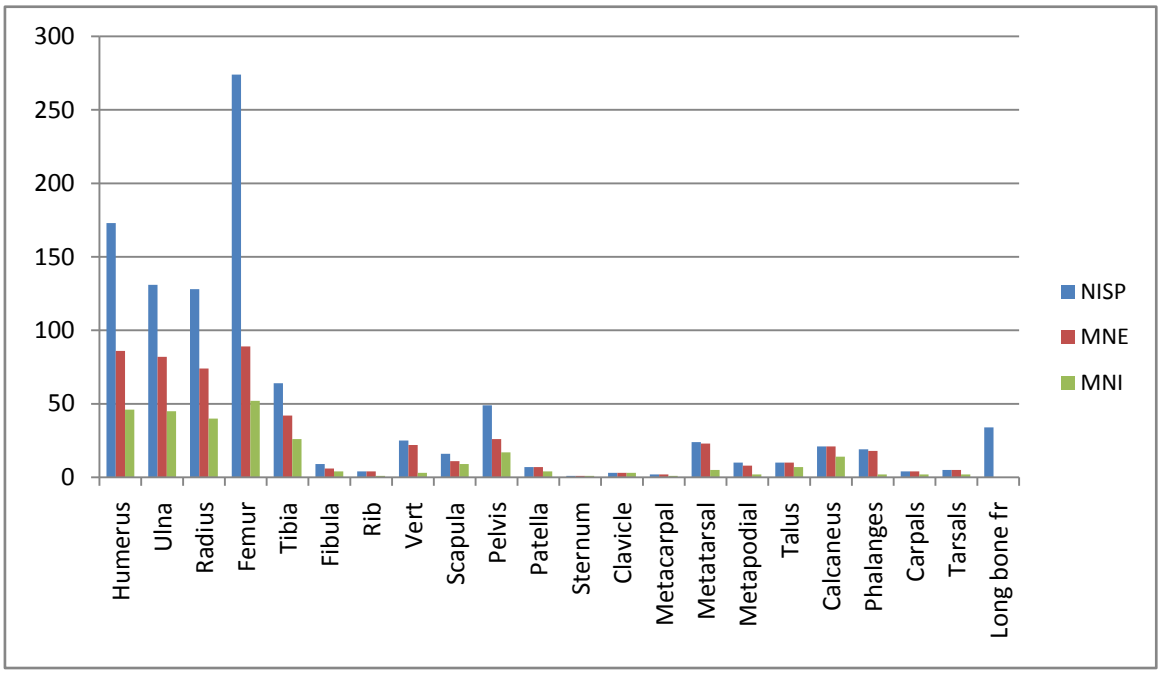


Figure 5.3. Member 4 fossil cercopithecoid postcranial skeletal element frequencies.

A full range of skeletal body parts is present in the Member 4 assemblage. The most discerning feature about the M4 deposit is that the limbs are disproportionately dominant compared to other body parts. Fore limbs specifically dominate in terms of NISP/MNE/MNI ratios. The femur is the largest occurring element at 27% (NISP: 274). Research on carnivore assemblages has demonstrated that hand and foot bones are normally swallowed whole and as a result the limb elements will be the remaining elements in a scat assemblage (Pickering 1999). The rock fall on the Member 4 talus would have crushed the more delicate elements such as fibulae and radii, and some small elements would have filtered through the rocks into cavities lower down in the talus. Therefore the limb elements such as the femur and humerus will have a higher survival rate. This is also evident from the head fragments discovered in the deposit (Fig. 5.5).

There are at least 52 individuals identified. These are based on the femur. They include four small individuals (a juvenile, a sub-adult and two adults), 45 medium adult individuals (which include a single *Theropithecus* individual represented by two femur elements), one large juvenile and two large adults.

The large frequency of limb NISP overshadows the number of skeletal elements preserved within the Member 4 deposit. The femur, the largest preserved skeletal element in the deposit, is represented by 274 specimens consisting of 52 individuals. This number points to fracture of the Sterkfontein fossil primate limb elements. The fragmentation of these elements is largely fresh and this points to post-depositional factors (Kibii 2004). However, the numbers of individuals represented by the limb elements also suggest higher values than the cranio-dental remains, as discussed by Kibii (2004). The high frequency of limb elements, along with the trampling and abrasion marks observed on the postcrania, point to the suggestion that the remains travelled a distance prior to being incorporated into the infill. Therefore surface slope wash of materials explains the presence of numerous quantities of limbs in the deposit. Kibii (2004) also suggests that some of the fossil cercopithecoids entered the cave and died naturally. This is supported by the presence of articulating specimens within the deposit (e.g. Fig 5.6).

The most diversity in primate taxa within the Sterkfontein Cave deposits is found in Member 4. This large diversity of papionins, colobines and Cercopithecini in the Member 4 deposit, coupled with the diversity observed in the preservation of felids and bovids (Kibii 2000), could be the result of two factors: the long excavation period of the deposit, from Broom's 1947 excavations to Clarke's excavations which still continue today; or the large variety of primates which existed within the Member 4 habitat. Although the latter explanation is likely, Member 4 has yielded the largest number of fossil specimens and 67% of the non-hominid fossil primate postcrania assemblage within the Sterkfontein Caves. Materials derived from this deposit are from the deepest excavation at 10 meters depth, and it covers the largest space in the cave at more than 30 meters wide. The size of this deposit and the commensurate quantities of materials it yields attract scholarly investigations. It is demonstrated by O'Regan and Reynolds (2009) that the Member 4 carnivore assemblage represents a time-averaged palimpsest. They suggest that sites preserving relatively few species of fossil carnivore remains than Member 4 better demonstrate fossil carnivore communities. Therefore the diversity observed in Member 4 is due to the long duration of accumulation.

Primates coupled with felids in fossil cave sites are large constituent animal groups in death trap scenarios of closed environments where agile animals comprise a large percentage of the animal community (Pickering, Heaton & Clarke 2004). The agility of primates and carnivores lends them to the danger of falling into caves. Baboons sleep in caves, and that situation would attract carnivore predation in the cave locales (Brain 1981). Fossil carnivore remains are also present in the Member 4 deposit; however they are not the second highest representation in terms of species and minimum numbers of individuals. In Member 4, bovids are the second most numerous occurring animals in the fossil deposits (Kibii 2004). The domination of bovids, which do not frequent cave sites, suggests that that several other factors played a role in the accumulation of Member 4 fauna. According to Kibii (2004) bovids and primates, particularly the small postcranial elements which occur in Member 4, were accumulated through multiple agents, such as carnivore voiding, as well as water action washing in skeletal remains from the surface around the cave entrance.

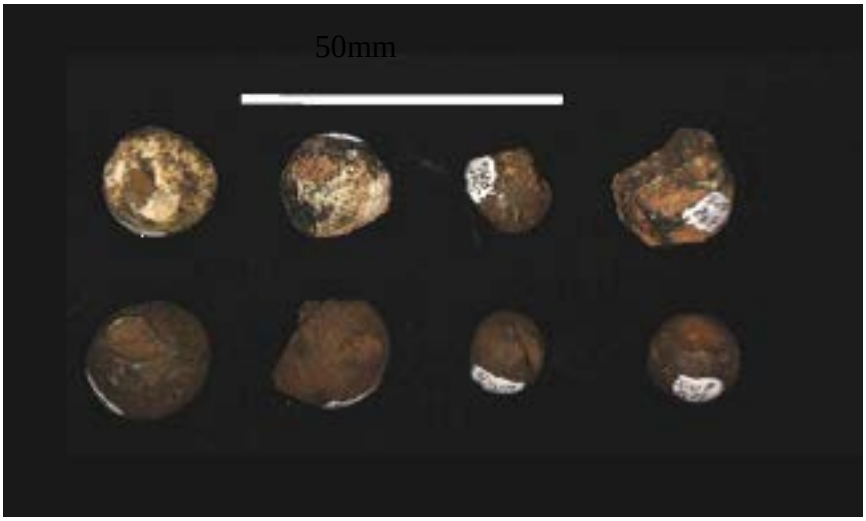


Figure 5.4. Example of the femur head fragments discovered within Member 4. Top row from left, SWP 876, SWP 892, SWP886 and SWP 869. Bottom row from left, SWP 879, SWP 877, SWP 874 and SWP 895.


Figure 5.5. SWP 1585, an articulated fore limb embedded in breccia from Dump 13 (Member 4).

## 5.4. STW 53 Infill

The STW 53 Infill preserves 25% (NISP: 39) of the total Member 5 fossil non-hominid primate postcrania assemblage. Medium sized adults dominate this infill at NISP 87% of the assemblage. Juveniles are 12% and only one sub-adult specimen is present. Small specimens occur at 10% and no large individuals have been identified in this assemblage. Fore limbs dominate this assemblage in terms of NISP, MNE and MNI frequencies (Fig.5.7). Hind limbs, axial skeleton and extremities are also represented in the assemblage. The radius is the most dominant skeletal element. It represents four individuals, two medium sized theropithecines (SWP 1198 and SWP 1204), one small juvenile (SWP 1308) and one medium unidentified cercopithecine (SWP 1279). In addition, five more individuals are present in this assemblage: four juvenile elements (SWP 1308; SWP 2376; SWP 2377 and SWP 23870) represent one medium sized juvenile individual within this deposit. There is a *Papio* (SWP 2385) and a colobine (SWP 1163). One sub-adult is present (SWP 2797) and one small individual derives from four elements (SWP 1308; SWP 2377; SWP 2796 and SWP 2696). Therefore a total of nine individuals is in this assemblage. It contains *Theropithecus* postcranial specimens. This genus has not been identified postcranially either in the Member 5 West deposits or in the Oldowan Infill. However, *Theropithecus* has been identified from dental remains in the Oldowan Infill (Pickering 1999). The only colobine postcrania discovered in the StW 53 deposit is located in square X53, at the eastern edge of the identified distribution of this infill. Carnivore accumulation has been inferred by Pickering (1999), and data derived from primate postcrania also support the presence of carnivore impact on the assemblage.

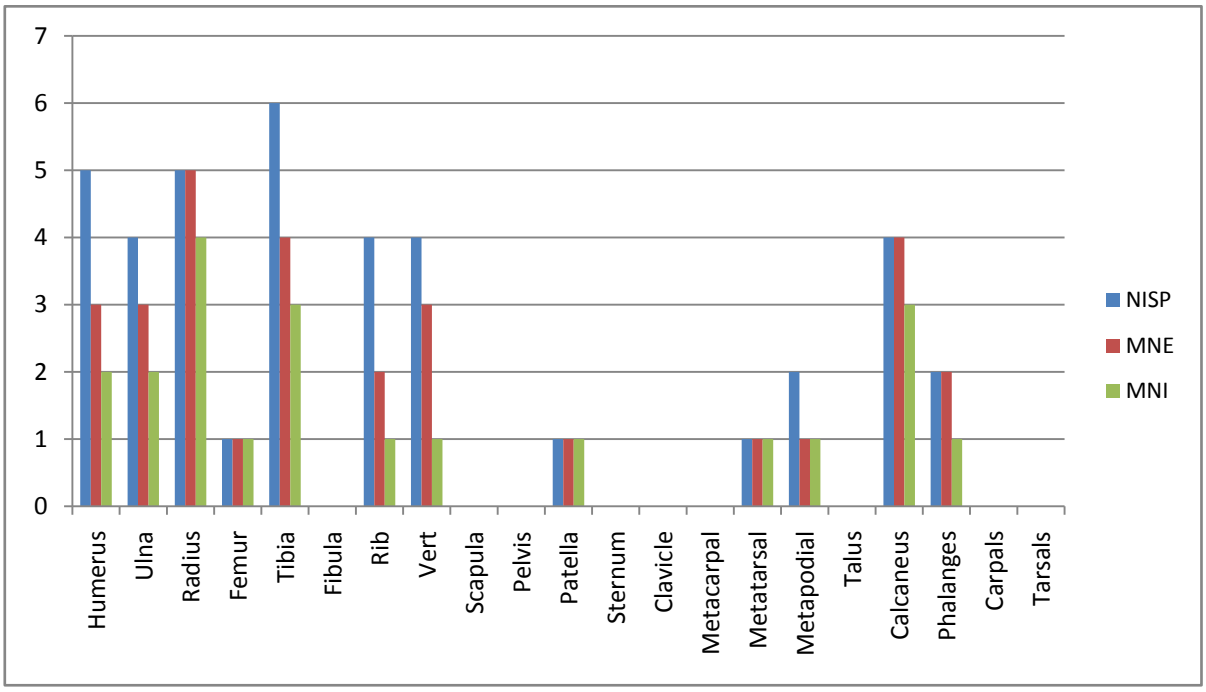


Figure 5.6. StW 53 fossil cercopithecoid postcranial skeletal element frequencies

## 5.5. The Oldowan Infill

The Oldowan Infill preserves the largest percentage (61%) of specimens within the Member 5 deposits with an NISP of 96. The full range of skeletal body parts is represented in the infill (Fig. 5.8). The axial skeleton has the largest NISP. These, however, comprise a single individual. There is a minimum of 7 (cMNI) individuals represented by four medium sized right proximal ulnae (SWP 2184, SWP 2193, SWP 2194 and SWP 2296) one small individual (SWP 2477), a single large individual (SWP 2779) and a medium sized juvenile (SWP 2481).

The high concentration of cercopithecoids in squares R51 and Q51 is at the interface with the Member 4 squares where there is an irregular contact between Members 4 and 5 (see Fig 1), and hence these fossils most likely derive from Member 4. Thus 57% of the primates in the Oldowan Infill are likely to be from an area of interface where it was difficult during excavation to separate the eastern margin of the Oldowan Infill from

Member 4. All body parts are represented in the area of the Member 4, Member 5 interface, which would be consistent with a the presence of a death trap scenario.

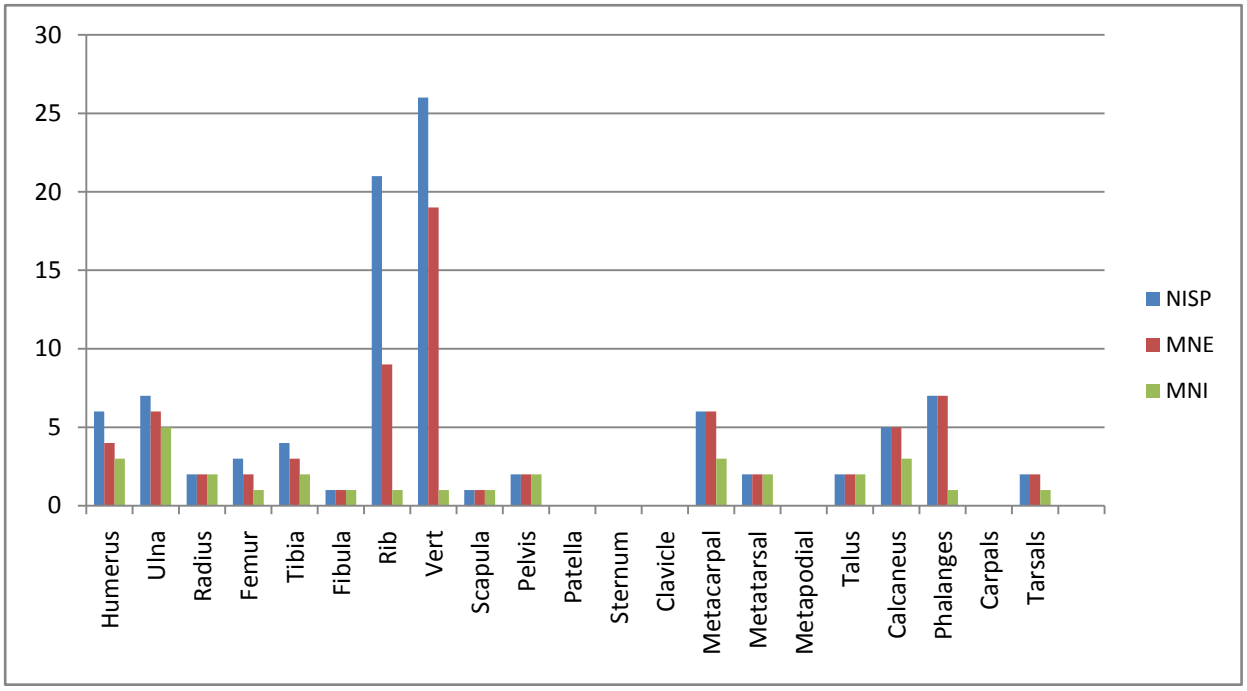


Figure 5.7. Oldowan Infill fossil cercopithecoid postcranial skeletal element frequencies

## 5.6. Member 5 West

Member 5 West preserves 11% (NISP: 19) of the Member 5 fossil postcranial remains. Even with a limited assemblage, the deposit preserves a full range of skeletal elements: fore limb, hind limb, axial skeleton and extremities are present in the sample. Tarsals have the highest representation in terms of NISP/MNE/MNI (Fig. 5.9). Four individuals (MNI) are present in this deposit: two small adults represented by two small adult tali (SWP 1284, SWP 2805) and two medium adults represented by two left calcanii (SWP 2741, SWP 2742).

According to Pickering (1999), the Member 5 West assemblage mainly accumulated as a result of hyaenas. Surface slope wash of materials and porcupines also played a role in the formation of the deposit (Pickering 1999). Surface slope wash of materials into the cave is supported by the domination of tarsals in the deposit.

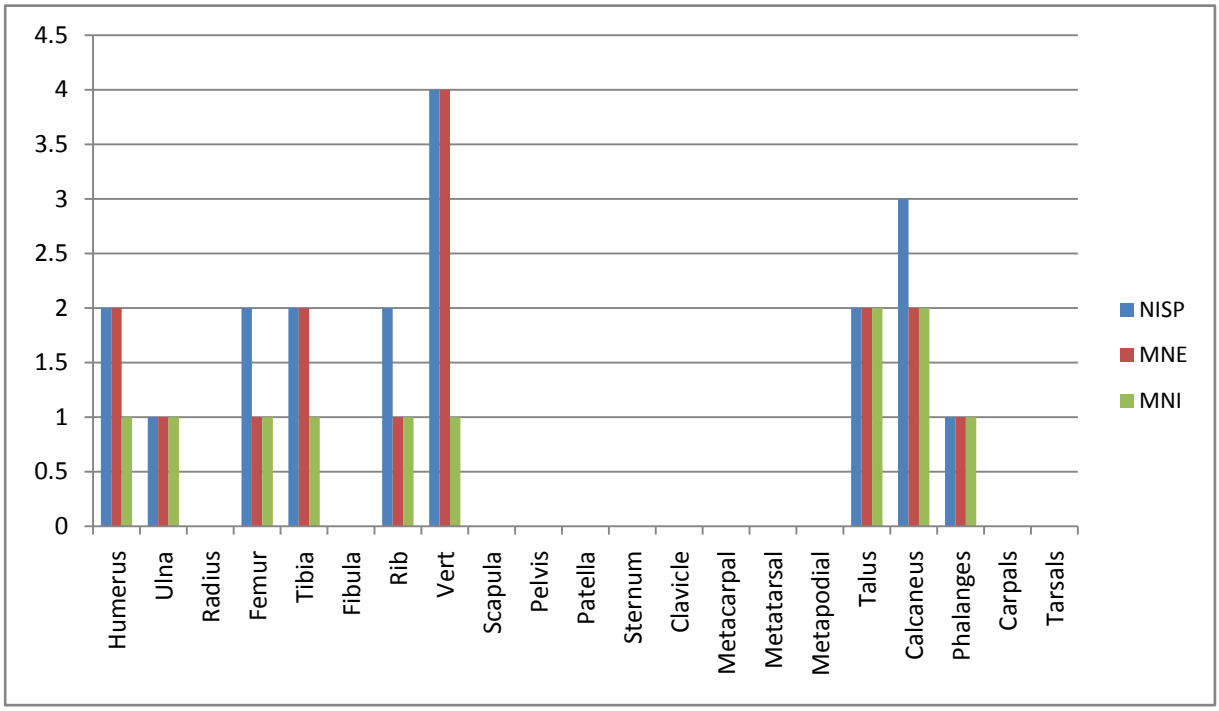


Figure 5.8. Member 5 West fossil cercopithecoid postcranial skeletal element frequencies

## 5.7. The Member 6 deposit

The Member 6 deposit is the most primate deficient faunal assemblage in the whole Sterkfontein Cave system. It is the only deposit within the Sterkfontein caves without hominid remains and with only two cercopithecoid specimens. Ogola (2009) suggests that there was a significant time gap between the Early Pleistocene Acheulian infill and the Member 6 deposit, which is considered to be Mid Pleistocene. Brain (1981) describes Member 6 as a very small deposit with a small faunal sample that cannot provide much taphonomic information. It fills a small space under the cave roof and rests conformably on the capping flowstone of Member 5 (L. Bruxelles, pers. com. to K. Kuman).

## 5.8. The Post Member 6 deposit

This deposit demonstrates an environmental shift from the Member 5 deposit. It constitutes 1.4% of the Sterkfontein fossil non-hominid primate assemblage at NISP of 22. Fore limbs dominate in terms of skeletal part representation (Fig. 5.10). The ulna and the humerus collectively constitute 41% of the total NISP in the assemblage. Nineteen elements are identified within the assemblage. A minimum of four individuals within the Post Member 6 infill consist of a medium sized juvenile individual (BP/3/19236), a small juvenile *Papio* represented by a humerus head fragment (S94-10064), and a distal humerus (SWP 1111) representing a different genus.

The Post Member 6 was accumulated by multiple accumulating agents at the same time or through one or more entrances (Ogola 2009). These include carnivores, porcupines, hominids and death traps (ibid.).

The L63 deposit was partly accumulated by porcupines (Reynolds et al. 2007). The discovery of hyaena coprolites in the deposit implies that hyaena used the cave or part of the cave as a den at the time of accumulation (ibid.). This deposit contains stone artefacts

which are not diagnostic to a specific industry but suggest to be younger than the Acheulian industry found in the Member 5 West (Reynolds 2003).

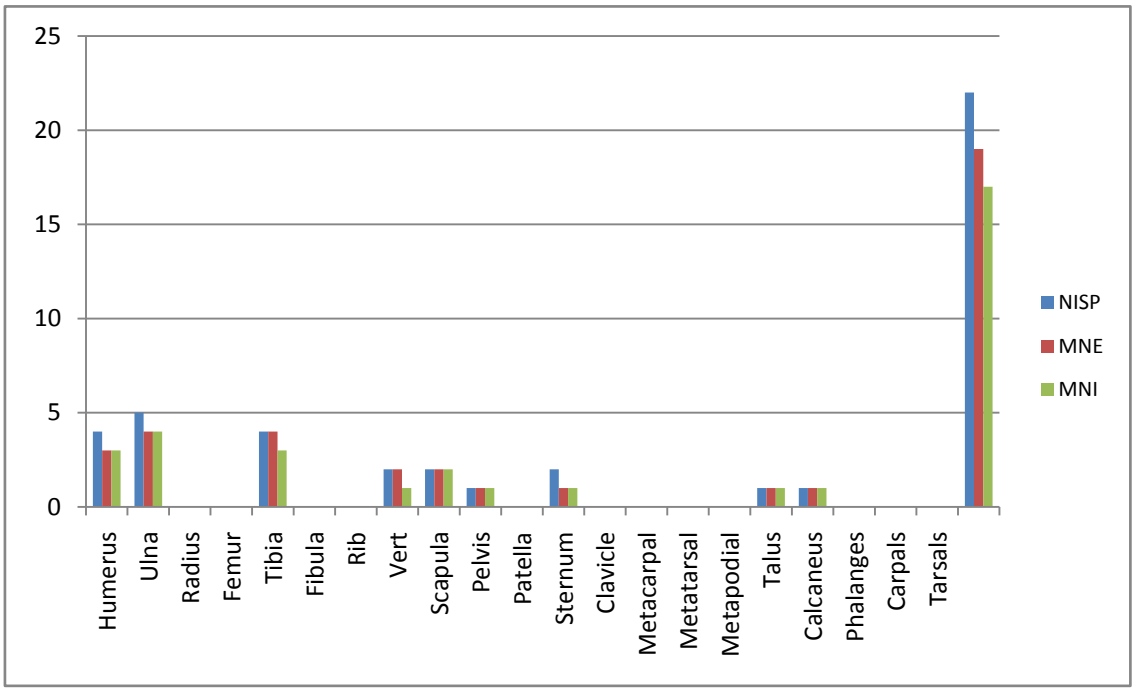


Figure 5.9. Post Member 6 fossil cercopithecoid postcranial skeletal element frequencies

## 5.9. Minimum number of individuals represented within the cercopithecoid postcranial assemblage, identified by taxa

### 5.9.1. Jacovec Cavern

Jacovec Cavern has a minimum of ten taxonomically identifiable cercopithecoid individuals. Only one is from the Orange breccia while the rest are from the mixed breccia found on the floor of the cavern.

Six *Papio*/*Parapapio* specimens which make up three individuals are found within the Jacovec. Two medium adults correspond with two left ulnae (BP/3/23271 and BP/3/23336). One of these adults is from the Orange Breccia while the second is from the

mixed breccia. A small adult *Papio*/*Parapapio* individual is identified from a proximal ulna (BP/3/21175) and a distal humerus (BP/3/18382).

Five *Papio* individuals are recognised. These are preserved within the mixed breccia only. These are: one medium juvenile individual identified from one left medium juvenile humerus head (BP/3/22757); one medium sub-adult left distal humerus (BP/3/31691); two medium adults are represented by two right proximal radii (BP/3/23235 and BP/31923) and a left distal humerus (BP/3/23389) signifies the presence of a small adult individual.

Two papionin individuals are also present in the mixed breccia. These are based on one medium adult, inferred from a right proximal ulna (BP/3/23718) and a medium juvenile suggested by a left proximal radius (BP/3/31553).

### 5.9.2. *Silberberg Grotto*

A minimum number of 13 individuals identifiable to taxa, is observed in the Silberberg Grotto. There are at least two *Parapapio* individuals recognised from two left distal humerii (SWP 1540 and SWP 1589). Six *Papio*/*Parapapio* individuals emanate from five left medium sized adult proximal femora (SWP 1?85, SWP 1385, SWP 1404, SWP 1698 and SWP 1700) and one small adult individual from a left proximal ulna (SWP 1594).

Two *Papio* radii specimens (SWP 1418 and SWP 1552) belong to one *Papio* individual. Seventeen *Papionini* indet elements suggest the presence of four individuals: one large individual derives from a right proximal radius (SWP 1416), a distal femur (SWP 1534) and a right proximal ulna (SWP 1604); a single medium sub-adult is inferred from a right proximal femur (SWP 1697) and two medium adult individuals are represented by two left proximal femora (SWP 1537 and SWP 1699).

### 5.9.3. *Member 4*

*Papio* sp has a NISP of 20 specimens. These comprise of a minimum of four individuals. One small sized adult individual is inferred from a right proximal radius (SWP 798); and three medium sized adults are deduced from three right proximal radii (SWP 793, SWP 803 and SWP 4243). Eighteen specimens (NISP) are assigned to *Parapapio* sp. *Papionini* indet is represented by 73 specimens which constitute a minimum of 17 individuals. cf. *Theropithecus* has an NISP of 14 comprising of a minimum of six individuals. These are observed from six right proximal ulnae (SF 3418, SWP 828, SWP 1148, SWP 1578, SWP 4001 and SWP 4084). Two colobine specimens are present in the deposit and two individuals are identified from these. These are: one large individual (inferred from the presence of SWP 13505, a large proximal ulna), and a small individual inferred from S94 10836, a right proximal ulna. One medium adult *Cercopithecoides* sp individual corresponds to the two specimens (SWP 1208, a left proximal ulna and SWP 883, a left proximal femur) recorded in the Member 4 assemblage.

5.9.4. *The StW 53 Infill*

Six individuals are taxonomically identified within the StW 53 Infill. One specimen of an adult colobine (a left proximal femur, SWP 1163) is present. One left proximal radius (SWP 1198) of a single *Theropithecus* adult is recognised. One medium *Parapapio* individual is indicated by a left proximal radius (SWP 1204). SWP 2385 (a right proximal humerus) suggests the presence of one medium adult *Papio*. Two *Papio*nin individuals (a small juvenile and medium adult) are represented by left unfused proximal radius (SWP 1308) and a right proximal radius (SWP 1306) respectively.

5.9.5 *The Member 5 West deposit*

The Member 5 West deposit only preserves two specimens which are identified to the tribe, *Papionini*. A left proximal femur (SWP 1154) is the only specimen attributed to a medium adult *Papionini* indet. SWP 1119, a distal humerus of a medium adult is the only specimen belonging to *Papio*/*Parapapio*

### 5.9.6. *The Oldowan Infill*

A minimum of three individuals are estimated from the Oldowan Infill. *Papio*/*Parapapio* has an NISP of 4 (BP/3/18382, a left distal humerus; SWP 2177, a right proximal radius; SWP 2296, a right proximal ulna; and SWP 2792, a right proximal humerus) which suggests the presence of one medium adult individual. *Papio* sp has an NISP of three (SWP 1120, a right distal humerus; SWP 2200, a right proximal radius; and SWP 2788, a right proximal ulna fragment). These consist of a minimum of one individual.

### 5.9.7. *The Member 6 deposit*

The Member 6 deposit preserves only two cercopithecoid postcrania which are not identifiable to taxa.

### 5.9.8. *The Post Member 6 deposit*

In the Post Member 6 deposit five cercopithecoid specimens are identified which indicate the presence of four individuals. A small juvenile *Papio* individual is distinguished by a right proximal humerus (SWP 10064). SWP 1285 (a left proximal ulna) corresponds to a small papionin adult individual. One medium adult colobine is represented by a right proximal ulna (SWP 1258), and two adult *Cercopithecus* specimens (SWP 1111 and SWP 1112) indicate the presence of a single adult individual.

## 5.10. Carnivore tooth pit analysis

Sixteen specimens are confirmed to have carnivore modification and can be assessed. These are discussed below.

SF 4217 from Member 4 is a left distal radius with two pits and a single score.

a. the first pit is located medially on the most antero-proximal corner of the medial malleolus, on the epiphysis. It has a length of 4.73mm and a breadth 4.3mm,
b. the second pit lies on the epiphysis on the most distal and posterior portion of the specimen. It is 4.98mm long and 4.39mm wide, and
c. the score is located on the epiphysis. It starts from the proximo-posterior-medial corner of the medial malleolus. It has a length of 7.54mm and a breadth of 4.77mm.

SF 1465 is a right proximal ulna belonging to a papionin individual. It possesses a pit located on its antero-proximal corner of the olecranon process with the following measurements, 5.68mm long and 4.88mm wide.

SWP 377d, a *Papio* or *Parapapio* distal humerus has three pits on the diaphysis, on the anterior lateral corner.

a. the first pit is 2.9mm long and 2.2mm wide,
b. the second pit's length is 2.1mm and the breadth is 1.9mm, and
c. the third pit has a length of 5.0mm and a breadth of 3.5mm

SWP 526, an unidentified left proximal femur, has a pit located on the posterior surface of the head, on the corner of the neck. Its pit, located on the diaphysis, has a length of 3.74mm and a breadth of 2.18mm.

SWP 531 is a *Papio*/*Parapapio* right proximal femur with three pits:

a. the first pit on this specimen is located on the diaphysis, on the anterior central portion of the femur neck. It has a length of 2.95mm and a breadth of 2.83mm,

b. the second pit measures 3.42mm long and 2.56mm wide; it lies below the neck on the diaphysis,
c. the third pit is located on the epiphysis, on the anterior corner of the greater trochanter, and, it measures 3.44mm long and 2.43mm wide.

SWP 756, an unidentified right proximal femur, has a score on the diaphysis and anterior surface of the head which is 9.06mm long and 5.67mm wide.

SWP 896 is an unidentified femur head with a score located on the diaphysis, on the distal ridge of head. It has a length of 8.46mm and a breadth of 1.45mm.

SWP 1104 (Fig. 5.10), a left cf. *Theropithecus* proximal ulna. It possesses three pits located on the diaphysis in a proximo-distal linear fashion:

a. the most proximal pit is situated on the lateral posterior portion of the olecranon. Its longest axis is 7.76mm and it is 4.51mm wide.
b. below pit a. is a second pit on the medial portion of olecranon. It is 4.51mm long and 3.74mm wide, and
c. the most distal pit has a length measuring 5.34mm and a breadth measuring 4.47mm.

SWP 1119, a *Papio*/*Parapapio* distal humerus possesses a pit located above the olecranon fossa on the anterior surface. It is 3.94mm long and 2.20 wide.

SWP 1137 is a *Papio* distal humerus with two pits:

a. the first pit is located on the anterior medial epicondyle, it is positioned proximo-distally in a linear manner. It is 5.94mm long and 4.99mm wide, and
b. the second pit is located posterior on the proximal portion of the trochlea covering most of the trochlea; it is 6.99mm long and 4.02mm wide.


Figure 5.10. SWP 1104, a left proximal cf. *Theropithecus* sp ulna with three carnivore tooth pits.

SWP 1140 (Fig 5.11), a *Papio*/*Parapapio* right distal humerus: This specimen possesses 3 pits-

a. on the anterior portion of the lateral epicondyle, located on the corner of the anterior proximal corner of the trochlea fossa (with a length of 7.01mm and a breadth of 5.02mm),
b. the second pit is located on the distal portion of the first pit and measures 6.99mm long and 5.02mm wide, and
c. the last and most distal pit is positioned on the anterior of the capitulum. It is 7.99mm long and 5.01mm wide.

SWP 1206, a left femur head of a *Papio*/*Parapapio*, has two pits located on the femoral head.

a. the first pit has a length of 7.63mm and breadth of 5.66mm.
b. the second pit is 5.66mm long and 1.66mm wide.

SWP 1263, a *Papio*/*Parapapio* left distal humerus has a pit located on the trochlea, on the anterior surface; its length is 6.13mm and its breadth 4.86mm.

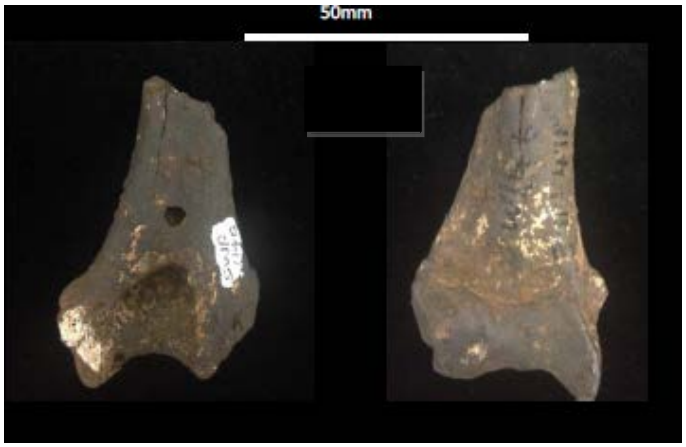


Figure 5.11. SWP 1140, a *Papio*/*Parapapio* distal humerus demonstrating carnivore toothpit marks

SWP 1271, a *Papio*/*Parapapio* right distal humerus; two pits are observed on this specimen.

a. the first is located on the posterior proximal corner of the trochlea; it has a length measuring 6.18mm and a breadth which measures 5.09mm, and
b. the second and distal pit is located on the inferior portion of the lateral epicodyle; it is 7.01mm long and 4.98mm wide.

SWP 1351, an indeterminate cercopithecoid right proximal femur: one pit is observed in this specimen on the anterior neck between the head and the lesser trochanter, it is 5.90mm long and 4.34mm wide.

SWP 1416, a *Papionini* indet right proximal radius with a pit on the diaphysis, on the medial side above radial notch, it is 7.25mm long and 6.66mm wide.

From the above sample, a pattern is observed in the location of the pits on humeral specimens. The pits are concentrated on the trochlea and capitulum. The results of the tooth pit data are outlined in Appendix C, Figures C19-20. Pits which occur on the epiphyses of the postcrania identified suggest that they were imparted by middle sized carnivores and hyaenas; lions are implicated by the breadth size. The length (>4mm) and

breadth size (>2mm) on the diaphysis, which is larger than indicate that they were inflicted by hyenas, dogs and or lions. Data derived from scores is inconclusive as the true population range is too wide and the sample size is too small to infer any meaningful conclusions.

# CHAPTER SIX

## RESULTS: SPATIAL DISTRIBUTION OF THE STERKFONTEIN FOSSIL CERCOPITHECOID POSTCRANIA

The complex periods of deposition, collapse and re-deposition of materials into the Sterkfontein caves are evident in the lack of distinct spatial clusters and clustering of primate fauna in possible mixed deposits. The various depositional processes recorded in Member 2 and Member 4 do not demonstrate taxonomic spatial bias among the primate remains. Jacovec Cavern's spatial separation of the hominids from the majority of the fossil cercopithecoids is interpreted as a result of hominid use at the time of accumulation. Member 4 primates demonstrate the least movement around the cave subsequent to deposition. The northern part of the StW 53 infill suggests that it is of a closer time frame to Member 4 due to the higher preservation of fossil primates in that corner and to the similar cercopithecoid taxonomic composition to Member 4. The drastic decline in primate frequencies in the younger Member 5, Member 6 and post Member 6 deposits has not yielded any spatial patterns. This chapter provides the description of spatial distribution patterns of cercopothecoid fossils and initial interpretations on the modes of accumulation which led to the accumulation of the fossil monkeys. The specimens are studied out of their original context; these were not digitally recorded. As a result, only the excavation squares and levels are examined for the spatial clustering.

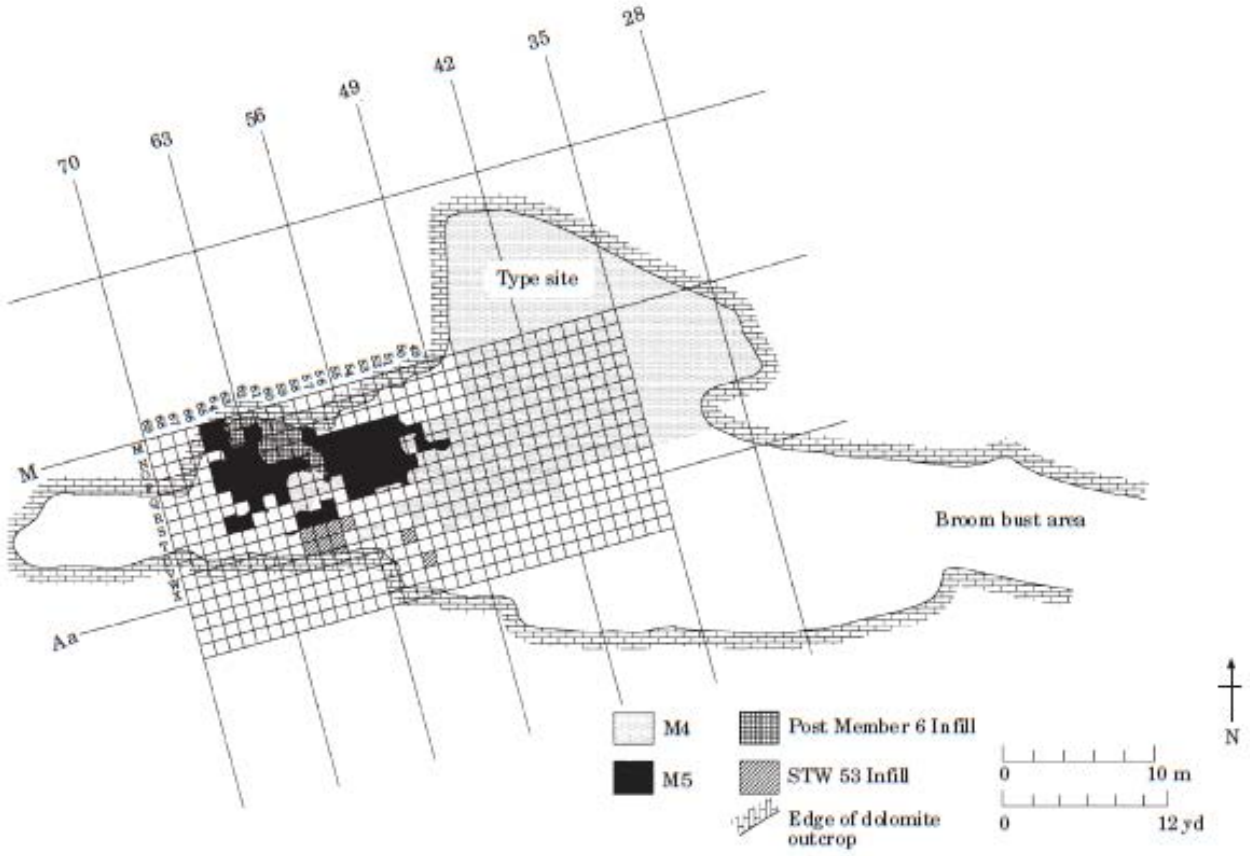


Figure 6.1. Sterkfontein Caves surface distribution demonstrating Member 4, Member 5 East, Member 5 West and the Post Member 6 infill. (after Kuman & Clarke 2000).

### 6.1. Jacovec Cavern

The Jacovec Cavern fossiliferous infills have formed through a number of depositional processes (Partridge 2003). The cave shaft opening, which is currently blocked, was located in the eastern end of Cavern. The ceiling and walls are covered by stony breccia with a patch of the older, orange breccia exposed in the ceiling. The orange breccia which is about 3 m

deep and has yielded remains of a hominid skull (STW 578). A younger westward sloping dark-brown, slightly calcified deposit which is about 1 m deep completely fills the eastern end of the Cavern (*ibid*.). On the floor, there is evidence of a collapsed orange breccia mixed with the younger dark-brown breccia, which yielded hominid fragments and cercopithecoid remains. Other taxa identified within the deposit include members of the Bovidae, Viverridae, Herpestidae, Felidae, Hyaenidae and Canidae families. Also preserved are *Pedetes capensis (spring hare*), *Potamochoerus porcus* (bushpig) and *Lepus capensis* (the Cape hare). These deposits were subsequently filled by a calcite flowstone which formed over these sediments (Partridge 2003). The *Australopithecus* partial cranium, StW 578, was excavated *in situ* from the orange breccia which is exposed in the roof (*ibid*.). The rest of the materials were recovered *ex situ* from the mixed breccia on the floor of the chamber (Kibii 2004)

The orange breccia contains only 5% (10 NISP) of the total Jacovec Cavern fossil cercopithecoid postcrania assemblage. Only two of these are long bones (one ulna and one femur), there are also two clavicles and six extremities. The *in situ* orange breccia also preserves 12 hominid specimens which represent six *Australopithecus* individuals (Kibii 2004). The small sample recovered in this part of the infill does not have much implication in terms of spatial distribution of skeletal elements as they were only provenanced to breccias type.

The younger brown breccia which is visible as a talus cone preserves 8% (NISP: 14) of the Jacovec Cavern fossil cercopithecoid post-crania sub-assemblage; the rest of which were discovered on the floor of the cavern. Neither juvenile cercopithecoids nor the hominids are found in this section of the cavern. Axial skeletal elements are limited, with the exception of two clavicles.

Based on the current study sample the orange breccia bears the least amount of primate remains within the Jacovec Cave System, but preserves all of the hominid assemblage. Most (NISP: 157, 86%) of the Jacovec fossil cercopithecoid postcrania lie on the cavern floor in the combined breccia. This could suggest that the majority of the cercopithecoid specimens in the orange breccia were spatially separated from the hominids which remained intact after the slump of the deposit. Kibii (2004) concluded that Jacovec Cavern primates accumulated

as a result of surface slopewash of the materials which were within the catchment area around the cave. A possible scenario therefore is that the hominids were within the collection close to the cave entrance in the east of the cave during the accumulation of the orange breccia. When the brown breccia accumulated cercopithecoids were the dominant primates within the catchment area.

### 6.2. Silberberg Grotto

Member 2 formed through different 'facies' (Partridge 2000; Clarke 2002, Bruxelles *et al.* 2014). A rocky talus cone which dips to the west formed underneath the roof of the Silberberg Grotto; this is the same infill which contained the StW 573 skeleton (Clarke 1999). Over a long period, this deposit was cemented by calcium carbonate water. However other sediments were slightly cemented and remain 'silty and soft" (Bruxelles *et al.* 2014:46) Water entered the cave from the entrance. Cavities also formed within the breccia as a result of erosion. These cavities would cause collapse of the roof above them. Calcite was deposited and flowstone covered the collapsed part of the StW 573. Some of the cavities were filled with flowstone floors from the bottom to the ceiling while others remained unfilled (Bruxelles *et al.* 2014).

Between 1978 and the 1980s, Alun Hughes' team removed lime miners' breccia from Dump 20 that covered the floor of the Silberberg Gotto. This included Member 2 and some parts of the Member 3 deposit. These were accumulated through an aven, in the roof of the Silberberg Grotto. Within the eastern region, which is highly fossiliferous, carnivores, some bovid remains and other taxa form part of the Silberberg Grotto (specifically the Member 2) faunal assemblage (Clarke 1999; Pickering *et al.* 2004a). The *Australopithecus prometheus* skeleton was located on the western face of the infill at the base of a steep slope with fossil cercopithecoid remains (Clarke 1999; Pickering *et al.* 2004a). The Member 2 *in situ* fossils, where most of the fossil cercopithecoid remains were recovered, were excavated by controlled blasting in the eastern end by Clarke in 1997 (Pickering *et al*. 2004). No spatial patterns are detected within and between the two facies, but the excavated areas are very limited.

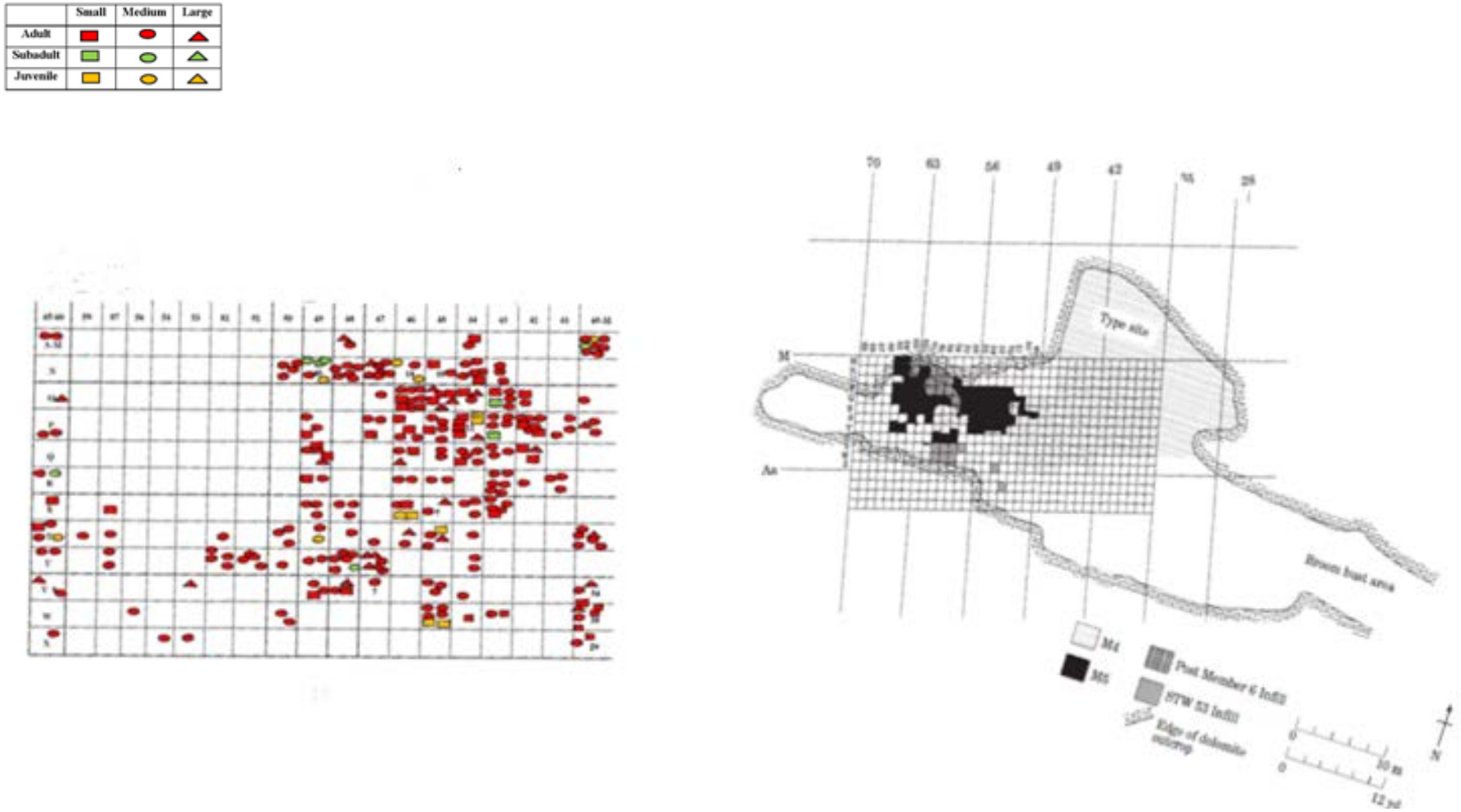


Figure 6.2 Member 4 spatial distribution of skeletal elements based on age and size

### 6.3. Member 4

The main cave opening at the time of accumulation of Member 4 was south-east of the cave (Partridge 1978). This shaft cavity was disturbed by successive roof collapses which led to the enlargement of the original shaft opening. Member 4 was a large underground chamber which was deposited as a talus and is now exposed due to weathering of the dolomite roof (Robinson 1962). The south-western part of the deposit collapsed leaving a void which was filled by subsequent deposits such as Member 5 deposits (Ogola 2009). A hanging remnant of Member 4 (the StW 53 sediments) is exposed in the western end of the cavern's southern wall. Partridge's (1978) stratigraphic analysis of the Member 4 deposit suggests the presence of four beds, A-D. Bed A is a red calcified sandy silt which contains some bone fragments and measures 2 to 3 m. Bed B is a reddish brown sandy loam which is exposed in the lower levels of the Extension site and the Type Site. It contains remains of *Australopithecus.* Bed B is also an *Australopithecus* bearing deposit; it has yielded the "Mrs Ples" crania. Bed C lies on top of an eroded section of Bed B. It is 0.5-2m reddish brown silty sand Bed D is a laminated flowstone deposit (Partridge 1978).

The Member 4 assemblage is more widespread relative to other deposits in the Sterkfontein Caves (Figure 6.1). The excavation starts from 1.2 m (four feet) down to 9 m (30 plus feet) below the datum line in squares e.g. N45, P42-45, R43-45 and T43. The northerly parts of Member 4 preserve the least (2.8%; NISP, 29) of the fossil cercopithecoid postcrania in Member 4. Only one small sized specimen was discovered from this part of the deposit. The largest concentration of the fossil cercopithecoids is in the more central to westerly located within Member 4. Dump 13 preserves the most specimens compared to other dumps from Member 4. The fossil cercopithecoid postcrania suggest that the western and the southwestern end of Member 4 (where the original cave opening was located at the time of accumulation) are possibly a different phase of the whole Member 4 deposits as this part of the cave preserves the highest frequency of cercopithecoids compared to other parts . The western-most part of Member 4, where it interfaces with Member 5 is very sparse in fossil cercopithecoids and preserves large sized skeletal elements at 6% of NISP, whereas these large sized monkeys are absent in the StW 53 deposit. Squares east of line 50 within

Member 4 are rich in fossil monkeys and preserve a large variety of size and age classes. This is very different from line 50 and the squares situated westerly of this line. High frequencies of fossil cercopithecoid specimens within the former squares are related to high numbers of hominids within the same region of the deposit. Hominid remains dominate and are the only primates in squares H42, Q40, U46, U45, V46, W46, W47, U43 and V43. These hominid remains however, are still concentrated in the same region (even though they are not the same squares) as the cercopithecoids, which is central to westerly of the deposit.

This concentration of the hominids in particular, is aligned with the north-westerly dip of the deposit. It also suggests that once the hominid fossil remains entered the cave, they, either did not tumble far from the entrance or the accumulation was through different phases. The distribution of fossil cercopithecoids also points to the same scenario. There is no spatial separation or clustering between cercopithecoid taxa within the deposit. Cranio-dental remains of the large colobine, *Cercopithecoides,* in the Member 4 deposit were recovered with other tribes, from the D13 and D14 dumps as well as from the main 'Type Site' as recorded in the Broom and Robinson's excavations.

Three different phases are detected from the spatial clustering in terms of the depth. Large concentrations of specimens are found in the upper levels of the Member 4 deposit and the very lower levels of the deposit, while the middle levels (between 18" and 25" below datum) preserve the least numbers of specimens. This clustering supports the hypothesis by Kuman and Clarke (2000) that Member 4 accumulated through different phases and probably through a relatively longer time span. Partridge (1978) identifies four beds within the deposit; however, analysis based on fossil primates currently distinguishes three periods.

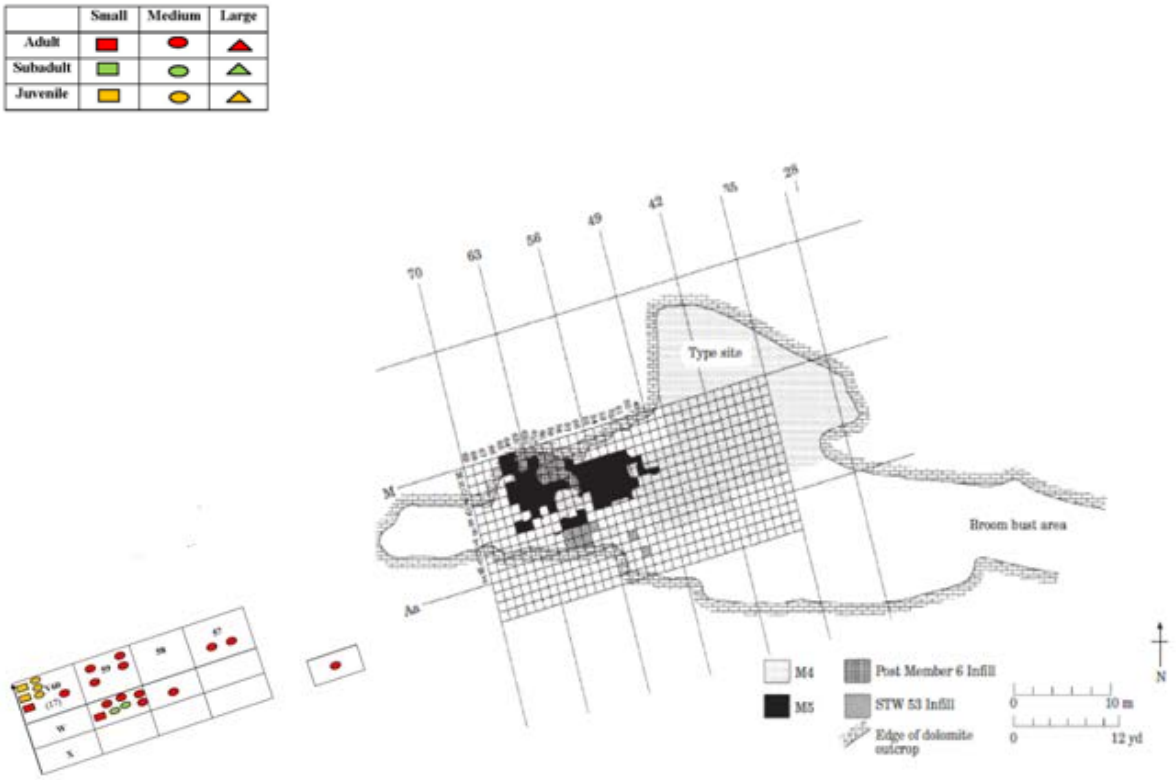


Figure 6.3. StW 53 spatial distribution of skeletal elements based on age and size.

### 6.4. STW 53 Infill

The collapse and erosion of the Member 4 deposit in the western and central areas left a hanging remnant of Member 4 which filled the cracks with an *in situ* solid breccia, StW 53 (Kuman and Clarke 2000). The entrance at the time of deposition was located in the south east (*ibid*). The excavation of the specimens is spread through a 3 meters (10 feet) depth and there is no visible pattern chronologically. This deposit is characterised by *Theropithecus* specimens. All *Theropithecus* specimens are concentrated in the W-V 59-60 squares. The genera *Papio* and *Parapapio* have also been identified in this deposit and they are more spread throughout the deposit compared to *Theropithecus.* The square X53, located south east of the StW 53 deposit and isolated from the main StW 53 deposit, preserves one specimen and the only *Colobine sp* in this assemblage. The square is currently isolated as the squares in between are currently under investigation. Most of the specimens (63% NISP of

the cercopithecoid postcrania assemblage and 88% NISP of the total fossil primate assemblage) lie in the north-western corner of the deposit, in square V60. This is followed by Square W59 and V59 which have four and six specimens respectively. The large concentration of the primate fossil remains entered the cave in the south east and, moved and aligned with the northwest dip of the infill to fill the northwest corner of the deposit. This suggests different phases of accumulation.

Clarke (1994) maintained that there is a stratigraphic separation between StW 53 and the Member 5 deposits. The difference between these deposits is also supported by faunal content (Pickering 1999, Kibii 2004). Taxonomic composition of StW 53 demonstrates a very different pattern from the Member 5 West deposit. The high concentration of specimens in the north western corner of the StW 53 deposit demonstrates a link between Member 4 and StW 53. The rest of StW 53 deposit is not as abundant with primate remains as the square V60 corner. StW 53 was formed after 2.6My, a period associated with a change towards a drier conditions and the decline of primate numbers. The corner possibly represents the earliest materials which accumulated at the early stages of StW53 deposition

Figure 6.4. Oldowan Infill spatial distribution of skeletal elements based on age and size.

## 6.5. Oldowan Infill

The Oldowan infill accumulated in a small area as a result of the collapse and erosion of the Member 4 breccia (Kuman & Clarke 2000). The deposit is limited to a 4 m (15 feet) horizontal surface in the Member 5 East, and lies 6 to 9 m (22 to 36) feet below datum in the deepest square which suggests that the materials accumulated through a narrow vertical shaft (*ibid.*).

The pattern of preservation of fossil cercopithecoid postcrania within these deposits in the Member 4 erosion channels supports the spatial and temporal separation of these deposits from either StW53 or the earlier Member 4 assemblage (see Figure 6.1). Based on present data, the spatial separation of this westerly deposit from the eastern Oldowan deposit is not clear. The majority of the postcranial specimens are concentrated in the R51 and Q51 (34% and 23% of NISP), accounting for more than half of the cercopithecoid postcranial assemblage. These squares are at the north easterly end of the Member 5 East deposits and at the junction with Member 4. This concentration does not discriminate based on body part or on size. Both squares, R51 and Q51, have a full range of skeletal elements. However, these two squares only form NISP 33% of the whole fossil primate assemblage. The cranio-dental remains, which form 55% of the Oldowan primate NISP, are spread throughout the deposit. However the archaeology shows them to be distinct as Member 5 West contains early Acheulian artefacts (Kuman & Clarke 2000).

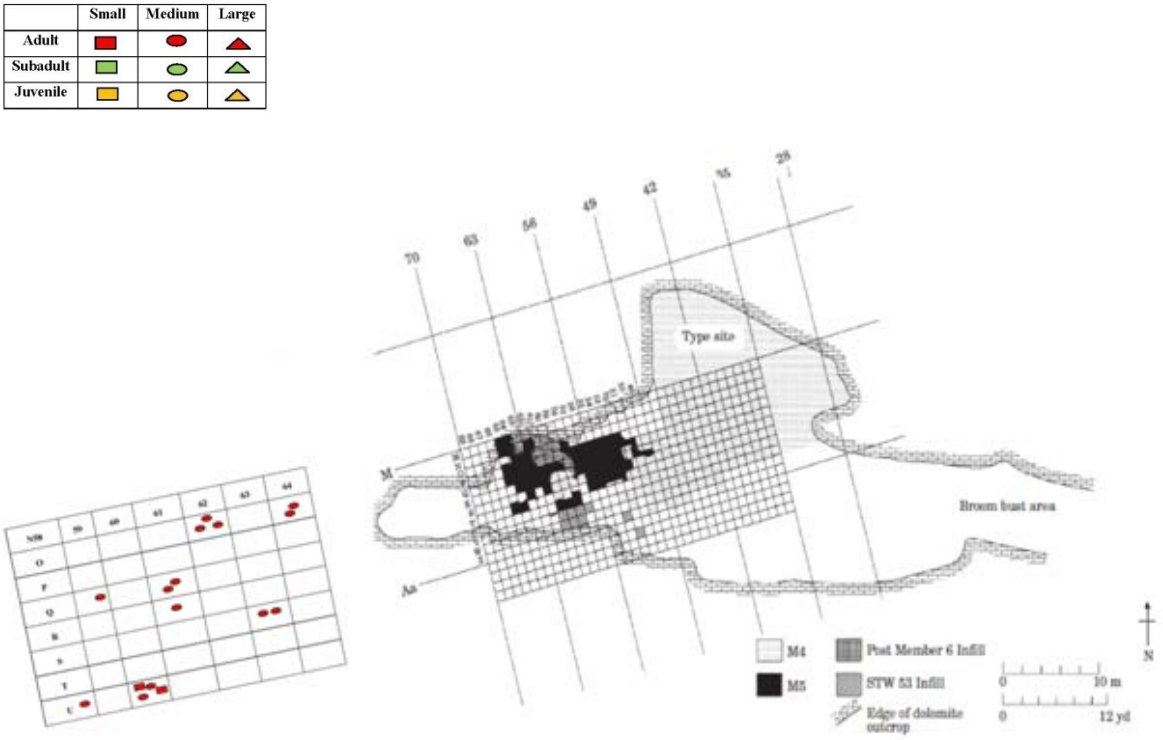


Figure 6.5. Member 5 West spatial distribution of skeletal elements based on age and size.

## 6.5. Member 5 West

The Member 5 West breccias (Figure 6.1) formed within the collapsed area of Member 4 (Ogola 2009). It is sandwiched between two flowstones, one overlying it and the other one curtaining Member 4 on the southern end. Two facies of Member 5 West have been identified (Ogola 2009). The earliest deposit consists of a fine brown breccia which lies against the Member 4 curtaining flowstone and was subsequently covered by a coarse pinkish breccia. Both sediments bear stone tools (Kuman & Clarke 2000). The pinkish breccia is covered by a capped flowstone to the north, and a yellowish microfauna breccia to the south. Square U60, located in the south, has a larger concentration (33% NISP) of the Member 5 West materials. This is within the pinkish breccia in the north. This is also where the only two small specimens within the deposit were discovered. There is neither a distinct pattern observed in the body part distribution within the deposit nor is there a pattern in the age profiles. The only two taxonomically identified specimens *Parapapio* (SWP 1119) and a

*Papionin* (SWP 1154) in the sample come from square Q59 which is in the south-east and square U58 at the south of the deposit. The specimens are spread between spits 17'9"-18'9" and 9’5"-10'5".

### 6.6. Member 6

Subsequent to the Member 5 deposits a flowstone cap formed in the north-western portion (Ogola 2009). The Member 6 breccia formed on top of this flowstone, beneath the cave roof. Ogola (2009) argues that the Member 6 cave was vertically restricted. Following this formation, parts of the Member 5 and Member 6 breccia were eroded away (Kuman & Clark 2000; Ogola 2009). Member 6 only preserves two cercopithecoid postcrania. These were discovered in the same decalcified deposit alongside bovids, carnivores, equids and hyraxes (Ogola 2009). Therefore no specific spatial information can be derived from the fossil primate faunal data. The near-absence of primates in this deposit is linked to taphonomic factors discussed in Chapter 7.

### 6.7. Post Member 6

The concentration of the skeletal remains within the Post-Member 6 deposit suggests that they predominantly accumulated in the early stages of formation of the deposit, as they are more concentrated in the lower levels, and abruptly ceased to accumulate towards the end of the deposit.

The erosion of the Member 5 and Member 6 breccia was followed by filling with the post-Member 6 deposit in a large area in the northern part of the cavern. It lies horizontally and is decalcified (Kuman & Clarke 2000; Ogola 2009). Within the Order Primates, there are no observed taxonomic spatial clustering preferences. The single *Homo sapien* specimen was discovered alongside fossil cercopithecoid remains (Kuman & Clarke 2000; Ogola 2009). Chronological distribution of the Post Member 6 primate assemblage indicates that 99% of the specimens derive from the lower levels (between 13'9" - 14'9” and 21'10" - 22'10") while only 1 primate specimen is from the upper level (8'1" – 9’1”). However, other taxa (e.g.

bovids and carnivores constitute 99% of the fauna NISP) are represented in the younger upper levels of the deposit.

### 6.8. Sterkfontein deposits spatial patterns based on fossil cercopithecoid postcrania

Spatial analysis of the Sterkfontein fossil ceropithecoid postcrania does not demonstrate any considerable spatial patterns. Complex geological processes of deposition, roof collapse and refilling of deposits point to complex taphonomic factors which have influenced the spatial arrangements of the assemblage at the time of recovery. Member 2 points to different taphonomic events which led to different facies of site formation as indicated by Bruxelles *et al.* (2014). The discovery of the majority of the specimens in the mixed breccia on the floor of the Jacovec Cavern, which is *ex situ*, points to a mosaic of events which led to the configuration of the Jacovec Cavern breccias.

Member 4, however, suggests different phases of accumulation represented in the deposit. Temporal variability in the accumulation of the deposit is proposed by the three phases discerned from the fossil cercopithecoid assemblage. Faunal occurrence of the northern corner of the StW 53 deposit demonstrates to be closer in time to the Member 4 deposit. This is the deposit which Kuman and Clarke (2000) have suggested to be a hanging remnant of Member 4. The decreased primate frequencies in Member 5 deposits, even in the deep Oldowan Infill, point more to a changing environment than to spatial patterning.

The depiction provided by examination of the fossil cercopithecoid spatial arrangement of the Sterkfontein Cave deposits is that of complex processes of deposition, collapse and re-deposition which have rendered most of the materials *ex situ*, and as a result provides little significant data on spatial patterns within the cave.

# CHAPTER SEVEN

# DISCUSSION

## 7.1. Taxonomy of the fossil Cercopithecoidea of the Sterkfontein fossil cave site

Three papionin genera are identified from the Sterkfontein Caves fossil postcrania, *Parapapio, Papio* and *Theropithecus.* A Cercopithecini, *Cercopithecus* is present in the assemblage. Colobines are present and so is the large fossil colobine, *Cercopithecoides sp.* The fragmentary nature of the Sterkfontein fossil cercopithecoid postcranial remains has impacted on the study by reducing the percentage of identifiable  Rock fall, sediment compaction, lime mining activities and excavation damage have contributed to the fragmentation of the assemblages. None of the cercopithecoid postcrania could be indisputably linked to cranial remains from the same deposit.

Cranio-dental data demonstrate a more varied picture of taxa which were accumulated into the Sterkfontein Caves deposits. Seven genera and eight species have been identified from fossil cranio-dental remains: *Papio izodi, Parapapio broomi, Parapapio jonesi, Chlorocebus aethiops, Theropithecus oswaldi, Cercopithecoides williamsi, Colobus sp.* and *Cercocebus*. However, none of the postcranial elements could be confidently assigned to species level. The poor state of preservation of the skeletal elements and the general rareness of identified fossil postcrania which can be utilised as comparative materials also contributed to the restriction in identifying the specimens to the lowest (i.e. species) possible level.  The distinction between *Papio* and *Parapapio* skeletal elements was also hindered by fragmented skeletal elements. A quarter of identified specimens could not be differentiated between *Papio* and *Parapapio,* and therefore a general category *Papio*/*Parapapio was* created. This is also the most commonly occurring taxa. The difficulty in delineating between the *Papio* and *Parapapio* genus has been part of Sterkfontein papionin classifications as early as the 1970's. Eisenhart (1974) stated that

*Parapapio* dentition is not easily distinguishable from *Papio*. The nasal side profile has been applied as a distinguishing trait between the two genera (Eisenhart 1974; Brain 1981). Even the validity of this character as a marker between *Papio* and *Parapapio* has been questioned (e.g. Jones 1978). The debate surrounding this distinction demonstrates the morphological overlaps between the two genera. Even in this study, the author could not make distinction between the two genera.

Sterkfontein preserves skeletal elements which are assigned to the *Parapapio* genus, and a large contingent of skeletal remains which are very similar to *Papio*. The sizes identified within *Parapapio* are also variable. Data derived from fossil cercopithecoid postcrania remains in the Sterkfontein deposits suggest the presence of small, medium and large sized *Parapapio*. This range of sizes and the variable upper forearm morphology are a likely indicator of different species as suggested by Jablonskii *et al*. (2008). However, due to the incomplete nature of the specimens, none of these could be identified to species level.

Even in the light of a very fragmented and limited postcranial assemblage, *Parapapio* morphological traits assessed in this study are consistent with East African *Parapapio* and also point to a generalist with a mosaic of morphological traits. The generalist nature of *Parapapio*'s forearm suggests that the genus navigated various substrates in the ecosystem. Therefore a generalist *Parapapio* would have survived the changing environment of Sterkfontein from the Pliocene to the Early Pleistocene.

South Africa's fossil *Papio* is regarded as ancestral to modern *Papio*, as suggested by Gilbert and colleagues (2016) in their assessment of fossil humeri of *Procercocebus* and *Papio* from Taung, South Africa. The fossil *Papio* postcranial remains from Sterkfontein have demonstrated commonality with the modern *Papio* species, suggesting some relationship between the modern and fossil variants of the genus *Papio*. The genus *Papio* on the other hand seems to have survived major environmental shifts which took place from the Plio-Pleistocene to the present day and outlived most fossil cercopithecoid counterparts in southern Africa. *Papio* occupies the widest parts of modern day Africa

with varied species constituting the genus (Napier & Napier 1967). The relationship between fossil and modern *Papio* species in Africa is yet to be investigated.

The long time span of *Papio* and *Parapapio* genera in the Sterkfontein caves fossil record supports the conclusion reached by numerous authors (Heaton 2006; Williams *et al.*, 2007; Gilbert 2008) that the changes in the Sterkfontein palaeoenvironment were gradual and that the habitat was quite variable, accommodating different primate species. Future research on the Member 3 deposit and its contents could shed more light on the transition between Member 2 and Member 4.

Twenty-two percent of identified postcrania in the Member 4 cercopithecoid sample assessed by Ciochon (1993) were *T. darti* specimens. No fossil cranio-dental remains have been assigned to *Theropithecus* earlier than Member 5 deposits. However, this does not exclude the presence of *Theropithecus* in the environment at the time. *Theropithecus* is present in Gladysvale between 2.5 My and 1.7 My (Berger *et al.* 1993).

The dominance of papionins over other members of the Cercopithecidae family correlates with data derived from cranio-dental remains. Colobines are present in the Sterkfontein fossil record, although in limited numbers. Their scant numbers are likely to be a factor of the environment within which these primates existed. Even terrestrial *Cercopithecoides* is not as abundant as terrestrial papionins. The *Cercopithecoides* identified in the Sterkfontein sample is probably *C. williamsi.* However, data derived from this study is not sufficient to attribute the specimens to the species.

Taxonomic variability is demonstrated by primate postcrania over time. Papionins dominate the earliest deposits. Jacovec Cavern and the Silberberg Grotto preserve comparable fossil cercopithecoid taxa. Continuity of these is observed in Member 4, which is the most complex and lengthy accumulation of deposits within the Sterkfontein Cave system. The largest taxonomic variability is observed in the Member 4 deposit, followed by Member 2 and the Jacovec Cavern. Papionins are less represented in the

younger Pleistocene deposits, and this is also marked by the appearance of small sized fossil primates, e.g. *Cercopithecus*.

El Zaatari and colleagues' (2011) study on molar micro-wear and dietary reconstruction of Sterkfontein Cercopithecoidea shows that there is no visible distinction between the earlier wooded deposits and the later more open ones in terms of the dietary habits of the fossil cercopithecoid taxa. The consistency of the dietary habits among fossil cercopithecoids is an indication of consistency in available and accessible food sources in the Sterkfontein valley area.

O'Regan and Reynolds (2011) hypothesis for time averaging represented within the Member 4 deposits is suggested as an explanation for the large primate taxonomic diversity observed in Member 4. Member 4 is the only deposit that preserves such a large contingent of cercopithecoid taxa in the whole Sterkfontein Cave system. Time averaging is likely, however, it cannot be established by the current study.

*Theropithecus* species in the southern African fossil record also occupy a specialised period during the Plio-Pleistocene and do not occur in that part of Africa by the late Pleistocene. The morphology and body size of *Theropithecus* are different from *Parapapio*. The large and robusr form of *Theropithecus* contrasts with *Parapapio* which has a smaller and more gracile frame. However, the smaller *T. darti* is recorded alongside *Parapapio* and *Papio,* while the larger *T. oswaldi* is coupled with *Papio* to the exclusion of *Parapapio.* Even though these genera are contemporaneous, the demands that the environment placed on them for their survival were probably not comparable. Predation from carnivores and availability of food sources would have had an impact on their survival in the Sterkfontein region.

*Parapapio broomi* and *Parapapio jonesi* had a mixed diet (El-Zaatari *et al.* 2005). Makapansgat *Theropithecus darti* had a diet similar to modern *Theropithecus gelada*; it was a grass and leaf eater. *Theropithecus oswaldi* had a varied diet which consisted of grass leaves and fruit, *Papio robinsoni* at Swartkrans probably subsisted on grass and/or

leaves (*ibid*.) El- Zaatari *et al.*'s study demonstrates that there is no distinction between the dietary habits of the earlier *Parapapio* and *Theropithecus* taxa over time. The lack of changes between earlier and younger taxa suggests that environmental shifts which occurred in southern African fossil cave sites were gradual and the change the environmental change was observed between 3Ma and 1.8Ma (Luyt & Lee-Thorp 2003).

In this study, the role that postcrania can play in taxonomic identification of fossil cercopithecoids is elucidated. However reliance on previous taxonomic studies and association with cranio-dental data is emphasised for a fuller picture.

## 7.2. Carnivore modification data

Tooth pit data sourced from the Sterkfontein fossil cercopithecoid postcrania assemblage are very limited. The nature of the method of analysis excluded a relatively larger sample of carnivore modified marks which were not manifested as pits or scores or which are covered by matrix.

The results of the tooth pits data suggest that they were mainly imparted by medium sized carnivores, hyenas and lions. *Panthera pardus, Chasmaporthetes* and an indeterminate hyaena are the common medium sized carnivores identified within all the Sterkfontein cave deposits (Kibii 2004; Pickering *et al.* 2004; Ogola 2009). *Panthera leo* is also part of the carnivore community represented in Sterkfontein fossil fauna assemblages, particularly in Jacovec Cavern, Member 2, Member 4 and the Member 5 deposits (Pickering 1999; Pickering et al 2004a; Kibii 2004). The length of the pits excludes the possibility of large sized carnivores as the cause of the pit.

Hyenas and leopards are known to use caves as breeding areas, dens and places of retreat (Simons 1966; Brain 1981; Lam 1992; Klein *et al*. 1999). Hyaena and leopard-accumulated assemblages are characterised by a high proportion of carnivores and primates (Simons 1966; Pickering 2002). This is the case for the Member 2 assemblage.

However, it is expected that hyaena collections will preserve coprolites and juvenile carnivore remains as they leave behind their young in dens when hunting. Brown hyenas (*Hyaena brunnea),* in particular, are known to prey on small carnivores for their young and transport the food back to the den (Brain 1981; Mills & Mills 1977). Therefore, carnivore juvenile remains will form a significant component of an assemblage collected by hyaenas and leopards in a den scenario. This is not supported by data from the Sterkfontein fossil faunal assemblages. Carnivore juveniles and coprolites are absent in Members 2, 4 and 6 (Kibii 2004; Pickering *et al*. 2004; Ogola 2009). Post Member 6 preserves carnivore juveniles and coprolite remains (Ogola 2009). Prior to that time the vertical alignment and depth of the entrance shaft would have made caves generally inaccessible for use as dens. Therefore a den scenario is not suggested for the earlier deposits.

Kibii's (2004) faunal analysis suggests that carnivore accumulation in Jacovec Cavern and Member 4 occurred as a result of resident carnivores which occupied the vicinity of the cave, above and around the entrances. Therefore leopards and hyaenas were likely using the cave localities as areas for retreat, as suggested by Simons (1966).

### 7.3. Taphonomy of the fossil cercopithecoids of the Sterkfontein Cave site

The taphonomy of the Sterkfontein fossil cercopithecoid community has indicated an array of processes which have impacted on the fossil remains. This is more so in the Jacovec Cavern and Member 4 deposit.

The absence of large juveniles and large sub-adult individuals is a distinct feature in the taphonomic history of the Sterkfontein Cave non-hominid primates. These age groups are present in other faunal size categories. The fact that other fauna preserve all age groups suggests that this is likely the result of taphonomic factors

The social organisation of *Theropithecus gelada*, the sole surviving species of this genus, is such that the females (and their young) have a strong coalition with each other and tend to remain in their 'reproductive units', while the males are 'socially peripheral' (Dunbar

1993: 432). Therefore females will most likely remain in a social group with juveniles, while males wander off without the young to join 'non breeding male groups' or to be part of another 'band' or 'herd' (Dunbar 1993). Reproductive units tend to avoid areas where risk of predation by carnivores is high, unless they can join herds and the prospective habitat is rich in food sources (*ibid*.). Therefore the likelihood that the catchment areas for the caves were further from these 'reproductive units' or similar organisations of these large primates is possible. However, the presence of these age groups in other families suggests that this could be the result of taphonomic bias.

The multiple scenarios which have impacted on the primate assemblages include surface slope wash, tumbling, sediment compaction, carnivore accumulation and death traps. The most common mode of accumulation, surface slope wash, is indicated in Jacovec Cavern, Member 4 and the Member 5 West deposits, even through other taphonomic processes took place within these deposits. Some of the Member 2 and Member 4 fossil primate remains fell into the cave and eventually died in the cave.

No two deposits preserve the same taphonomic package and no post-depositional feature is exclusive to a specific deposit. Due to the extent of the deposit and associated quantities, Member 4 preserves the widest range of accumulation patterns over the longest period of time. Member 4 is the only deposit which, based on fossil cercopithecoid fauna, demonstrates different patterns of accumulation (Kibii 2004). Locomotor habitat classification of the Member 4 cercopithecoid postcrania indicated the presence of three habitat types, forest, open woodland and grassland (Elton 2001).. O'Regan and Reynolds (2009) propose that Member 4 is a long, time-averaged sample. Member 4 accumulated through a period spanning around 300,000 years (Partridge 1978). This is sufficient time for different modes of accumulation to take place through time or even different cave entrances which were opened due to processes such as dissolution of dolomite and voids caused by collapse of the breccia.

Cercopithecoids in the Member 5 deposits are outnumbered by carnivores, bovids and other macro-mammalian taxa (Pickering 1999). This trend is also observed in Member 6 and Post Member 6 (Ogola 2009). In the southern African fossil record, the tendency is

also observed in Swartkrans and Kromdraai. The Early Pleistocene of Swartkrans (Member 3) only preserves *Papio robinsoni* and *Theropithecus oswaldi*; Coopers (A and B) preserves a wider variety of cercopithecoid taxa (*Papio*, *Cercopithecoides* and *Theropithecus*). However, after the climatic changes associated with the time of the early Acheulian industry and *Homo ergaster* on the landscape, these primates are significantly reduced due to the reduction or increased patchiness of more wooded, closed conditions.

Previous studies of the Sterkfontein fossil faunal assemblages had indicated that carnivores have played a role in the accumulation of fauna in Jacovec Cavern, Member 4, StW 53 and Member 5 West (Kibii 2000; Kibii 2004; Pickering 1999). Even through tooth pit data analysis undertaken in Chapter Five, the current study has demonstrated that, medium-sized carnivores, leopard and hyaena, are the main carnivores which have imparted tooth pits and scores on the primate remains mainly from the Member 4 deposit. The identification of these carnivores from the actual tooth pit sizes is a new perspective on the taphonomy of the Sterkfontein cave. Previous studies had recognised the involvement of these carnivores from the types of assemblages and not necessarily from analysis of the actual tooth imprints. No differences are inferred between the various deposits as the sample size is too small to make any generic statements about the deposits.

Post-depositional fragmentation of the limb elements has rendered a large portion of the assemblages unidentifiable. As a result, the larger limb elements in the Sterkfontein fossil cercopithecoid postcranial assemblages dominate. Humeri constitute the largest percentage of identified elements with an NISP of 85, comprising 32% of the total identified NISP, while femora are the least identified at NISP of 30 (11% of the total NISP. Pickering and Carlson's (2002) study of baboon bone mineral density at Swartkrans has concluded that primate skeletal representation is not the result of bone density but of an assortment of other factors such as size, length, shape and body mass destructibility. Stated simply, the larger and longer limb elements are the postcranial elements with a higher survival rate in fossil faunal assemblages.

## 7.4. Palaeoenvironmental and evolutionary implications of the Sterkfontein Caves fossil Cercopithecoidea

Non-hominid primates have played a significant role in interpreting African Plio-Pleistocene palaeoenvironments. Due to their relative abundance in fossil cave sites, analysis of fossil primate remains has provided a glimpse into African palaeoenvironments. The observed transformation of the primate community over time (from the older moister through to the younger and drier environments) is observed in terms of taxonomic variation and body size. It suggests that these cercopithecoids, and primates in general, played a very significant ecological role in the Plio-Pleistocene environments at Sterkfontein. The cercopithecoids in the region were likely able to co-exist by adopting seasonal feeding patterns, or alternatively their diets were less similar than the data currently suggest (Fulwood 2012).

The evolution of the Sterkfontein fossil cercopithecoids suggests predominance of the papionins (*Papio* and *Parapapio*) in the earlier deposits, Member 2 and Jacovec Cavern. They are also the most common taxa in the younger Member 4 deposits. The Member 5 deposits associated with a drier open environment coincide with a decline in primate representation and the disappearance from Sterkfontein of the *Australopithecus* genus. The environmental shift to more open habitats in Member 5 is emphasised by the reduction of the taxonomic variation and number of primates that was preserved in Member 4.

Data derived from fauna and stable isotope analysis suggest that the shift from Member 4 to Member 5 habitats is marked by more open environments with some woodland cover (Reed 1997; Kuman & Clarke 2000; Luyt 2001; Lee-Thorp *et al.* 2007). The shift from closed woodland to more open environments was observed from around 3 Ma and 1.8 Ma (Luyt & Lee-Thorp 2003). Luyt and Lee-Thorp (2003) have applied the ratio of C4 grazing bovids to C3 browsing bovids to determine the variability of grasslands during the Plio-Pleistocene. This change to more open environments is observed particularly well in the younger Member 5 Acheulean deposits, coinciding with a drastic reduction in

primates in the environment. This shift is evident in the C4 grass biomass, which saw a boost in the quantity of grazers between 1.8Ma and 1.7Ma (Luyt and Lee-Thorp 2003).

# CHAPTER EIGHT

# CONCLUSION

Isolated fossil postcrania of non-hominid primates are common in the southern African fossil record. Attempts at taxonomic identification of these isolated elements have been undertaken; however, none has assumed a comprehensive analysis of the postcrania in the Sterkfontein cave site. The current research hypothesis has established that taxonomic discrimination of skeletal elements at genus level is feasible. This research has examined the extent to which Sterkfontein's isolated fossil cercopithecoid postcranial morphology can be linked to taxonomy and phylogeny by undertaking qualitative combined with quantitative assessments. Assigning the taxa to species level is more complicated considering the fragmented state of the Sterkfontein fossil cercopithecoid remains and the paucity of available comparative taxa in the fossil record. However, the research has established that trait, size and shape are important factors in taxonomic assessments of isolated skeletal elements to at least genus level. The Sterkfontein cave deposits preserve a large assemblage of fossil primate remains compared to other South African fossil Plio-Pleistocene sites. For the first time, the fossil cercopithecoid postcrania are identified to taxa and correlated to cranio-dental taxa which have previously been the only source for conclusions on fossil monkey identifications in the Sterkfontein Caves.

Through the use of comparative modern cercopithecoid postcranial specimens and data from East African sites, this study was able to make taxonomic assessments of the Sterkfontein fossil cercopithecoid postcrania. This study relied on comparative taxa from East African sites which yield postcrania associated with crania and dentition. Sterkfontein site does not preserve fossil cercopithecoid postcrania belonging with taxonomically identifiable cranio-dental specimens. This lack of association has, in the past, obstructed identification of cercopithecoid postcrania in southern African fossil sites.

Data derived from fossil cercopithecoid postcrania support the large diversity of primate taxa in Member 4, which, according to O'Regan and Reynolds (2009), is a 'time-averaged palimpsest'. This context also resulted in a drastic increase of primate taxa compared with

the earlier Member 2 deposit (ca 3.67 My) and the Jacovec Cavern. Surface slope wash and gravitational slump which occurred in the accumulation of Jacovec Cavern (Kibii 2000) influenced the preservation pattern of macro vertebrates and resulted in limited numbers of primates. Current research has also confirmed the subsequent radical reduction in numbers of fossil monkeys in the younger infills such as the StW53, Member 5, Member 6 and Post Member 6 deposits. In these deposits the same taphonomic processes took place which influenced the scant preservation of the primates. These also formed within more limited periods compared to the longer duration seen in the accumulation of Member 4.

The quantitative and qualitative analysis of the Sterkfontein fossil cercopithecoid postcrania in this thesis has provided evidence of the probability of more fossil cercopithecoid diversity than was previously reported. For example, the existence of *Theropithecus* in Sterkfontein Member 4 is suggested, even though there is a lack of cranio-dental remains for the genus in the deposits, which had suggested its absence. The presence of *Theropithecus* interpreted from postcrania provides a different perspective on the evolution of the genus in South Africa. The abundance of *Theropithecus* fossils in the Pliocene at Makapansgat and the early Pleistocene at Swartkrans suggests that one might also expect it to have been present in the Sterkfontein Valley landscape in the early Pleistocene. This is now indicated by the identification of the genus, based on postcranial remains in Member 4. More cranio-dental data on the presence of *Theropithecus* in Member 4 will possibly shed more light into the evolution of this genus in the Plio-Pleistocene.

The predominance of fossil cercopithecoid remains over hominids in the Sterkfontein deposits is attributed to the success of the fossil monkeys, in particular, the papionins, during the Plio-Pleistocene. This has also resulted in the large numbers of cercopithecoid remains in the cave deposits.

The cercopithecoid postcrania were identified to tribe and genus level and none of the specimens could be confidently assigned to species level. *Parapapio* demonstrated variability in the shoulder joint. The size and morphological variation observed in the taxonomic analysis of *Parapapio* postcrania indicate the possibility of more than one species. The Sterkfontein fossil *Parapapio* possesses similar functional anatomy and relative size as the East African *Parapapio*. The genus *Papio* has had no record of comparable fossil postcrania. Plio-Pleistocene *Papio* fossil history in East Africa is virtually unknown; some of

the remains previously identified as *Papio* have been subsequently allocated to *Parapapio* (Jablonski *et al.* 2008). This had implications for the thesis. First, no record of fossil *Papio* postcrania is available for comparative purposes. Secondly, it demonstrates that there is a large overlap of morphological traits between the two genera. As a result of this ambiguity, which was also observed in the current investigation, a general class of *Papio* and *Parapapio* was created. The fossil *Papio* postcrania remains from Sterkfontein have demonstrated commonality with the modern *Papio* form, therefore suggesting a close relationship between the modern and fossil variants of the genus in southern Africa.

Taxonomic analysis of the fossil cercopithecoid postcrania demonstrates locomotor capabilities of Sterkfontein fossil monkeys, which in turn have contributed to palaeoenvironmental reconstructions of the region in the Plio-Pleistocene. The large contingent of taxa with generalist locomotor capabilities such as *Parapapio* and *Papio* and their long time span, from the Pliocene through to the early Pleistocene, points to an environment with a mosaic of habitats.

The general Sterkfontein faunal assemblage is highly fragmented due to rock fall, sediment compaction and blasting damage from lime mining as well as excavation damage. The Sterkfontein cave deposits' taphonomic history of collapse and re-deposition of infills has impacted on the high fragmentation of the limb elements and resulted in relatively large NISP relative to MNI numbers. The high representation of femora over others limb elements is the result of such taphonomic factors.

Tooth pit data analysis implicates medium sized carnivores, lions, canids and hyaena as the pre-dominant agents which accumulated the fossil monkeys, and possibly, the hominins. Earlier research on the taphonomy of various deposits of the Sterkfontein caves indicated that carnivores, in combination with other taphonomic processes such as surface slope-wash, death trap and porcupine collection, were active agents in the accumulation of the cercopithecoids of Jacovec Cavern, Member 2, Member 4 and the younger deposits, StW 53, Member 5 west and the Member 6 and Post Member 6 deposits (Brain 1981, Pickering 1999, Kibii 2000, 2004, Pickering *et al*. 2004, Ogola 2009). Tooth-pit analysis undertaken in this research supports the hypothesis that carnivores were not the main accumulator of the cercopithecoid fossil remains overall within the caves. The carnivores, however, did have an impact on the fossil cercopithecoid assemblage. Tooth pit analysis has revealed that, based

on the size of the pits on the diaphyses and epiphyseal ends, the general group of medium sized carnivores, hyenas, lions and dogs are the main agents involved in the accumulation of the cercopithecoid fossil remains. This research, has, for the first time, revealed the nature of the carnivores which have accumulated the fossil monkey postcrania through various deposits.

The spatial arrangement of the postcrania has indicated variation over time. The complex Member 4 deposits only demonstrate large concentrations of fossil cercopithecoid specimens in the upper and the very lower levels of the deposit. This clustering supports the hypothesis by Kuman and Clarke (2000) which states that Member 4 accumulated through different phases and probably through a relatively longer time span and by different agencies. The large concentration of fossil primate remains within the north-westerly part of Member 4 demonstrates alignment with the stratigraphic dip of the deposits. The same conclusion is reached for the north-western corner of the StW53 deposit, which possibly represents the earliest deposition subsequent to the Member 4 period.

This study has provided new scope for cercopithecoid postcrania taxonomy in southern African fossil cave sites. The research has given context to the numerous cercopithecoid postcrania which have been discovered in Sterkfontein caves. It has demonstrated the importance of considering postcranial remains as part of a suite of cercopithecoid and primate taxonomic studies.

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**APPENDIX A**

# STERKFONTEIN FOSSIL CERCOPITHECOIDEA POSTCRANIA CATALOGUE

Table A1. Catalogue of specimens derived from Jacovec Cavern

| Specimen no | Taxon | ElemenDt | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/22410 | *Cercopithecoidea indet* | Radius | prox. | R | Small | Adult |
| BP/3/22418 | *Cercopithecoidea indet* | Patella | Complete | R | Medium | Adult |
| BP/3/22419 | *Cercopithecoidea indet* | Patella | Complete | ? | Medium | Adult |
| BP/3/22446 | *Cercopithecoidea indet* | Femur | shaft | R | Small | Adult |
| BP/3/22456 | *Cercopithecoidea indet* | Radius | shaft | L | Small | Adult |
| BP/3/22470 | *Cercopithecoidea indet* | 2nd metatarsal | Complete | R | Medium | Adult |
| BP/3/22493 | *Cercopithecoidea indet* | 1st Phalanx | Complete | ? | Small | Adult |
| BP/3/22494 | *Cercopithecoidea indet* | Radius | shaft | R | Medium | Adult |
| BP/3/22610 | *Cercopithecoidea indet* | Fibula | shaft | | Medium | Adult |
| BP/3/22613 | *Cercopithecoidea indet* | Radius | Proximal | L | Medium | Adult |
| BP/3/22616 | *Cercopithecoidea indet* | Clavicle | medial | L | Medium | Adult |
| BP/3/22661 | *Cercopithecoidea indet* | Navicular | Complete | R | Medium | Adult |
| BP/3/22799 | *Cercopithecoidea indet* | 3rd metatarsal | Complete | L | Medium | Adult |
| BP/3/22852 | *Cercopithecoidea indet* | Tibia | shaft | | Small | Adult |
| BP/3/22416 | *Cercopithecoidea indet* | 1st Phalanx | Complete | R | Medium | Adult |
| BP/3/22518 | *Cercopithecoidea indet* | Calcaneus | Complete | R | Small | Adult |
| BP/3/22617 | *Cercopithecoidea indet* | Clavicle | lateral | L | Medium | Adult |
| BP/3/22669 | *Papio/Parapapio* | Ulna | prox | R | Medium | Adult |
| BP/3/22789 | *Cercopithecoidea indet* | Fifth Metatarsal | Complete | R | Small | Adult |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/22790 | *Cercopithecoidea indet* | Fouth Metatarsal | Complete | L | Medium | Adult |
| BP/3/22794 | *Cercopithecoidea indet* | 1st Metatarsal | Complete | ? | Medium | Juvenile |
| BP/3/22800 | *Cercopithecoidea indet* | Clavicle | Complete | ? | Small | Adult |
| BP/3/22866 | *Cercopithecoidea indet* | 1st Phalanx | Complete | ? | Medium | Adult |
| BP/3/22873 | *Cercopithecoidea indet* | Femur | shaft | L | Medium | Adult |
| BP/3/18382 | *Papio/Parapapio* | Humerus | distal | L | Small | Adult |
| BP/3/22413 | *Cercopithecoidea indet* | Fibula | shaft | R | Medium | Adult |
| BP/3/22459 | *Cercopithecoidea indet* | Calcaneus | Body | L | Medium | Adult |
| BP/3/22466 | *Cercopithecoidea indet* | Rib | shaft | R | Medium | Adult |
| BP/3/22471 | *Cercopithecoidea indet* | 3rd metacarpal | prox. | L | Medium | Adult |
| BP/3/22495 | *Cercopithecoidea indet* | Fibula | | | Medium | Juvenile |
| BP/3/22520 | *Cercopithecoidea indet* | Tibia | prox. | L | Large | Adult |
| BP/3/22575 | *Cercopithecoidea indet* | Radius | shaft | | Medium | Adult |
| BP/3/22604 | *Cercopithecoidea indet* | Tibia | shaft | | Small | Adult |
| BP/3/22624 | *Cercopithecoidea indet* | Patella | | R | Small | Adult |
| BP/3/22625 | *Cercopithecoidea indet* | 1st Phalanx | | | Medium | Juvenile |
| BP/3/22645 | *Cercopithecoidea indet* | Clavicle | shaft | | Small | Adult |
| BP/3/22660 | *Cercopithecoidea indet* | Radius | shaft | | Small | Adult |
| BP/3/22675 | *Cercopithecoidea indet* | Pelvis | Acetabulum | R | Small | Adult |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/22710 | *Cercopithecoidea indet* | Femur | prox. | R | Medium | Adult |
| BP/3/22738 | *Cercopithecoidea indet* | 1st Phalanx | | | Medium | Juvenile |
| BP/3/22739 | *Cercopithecoidea indet* | 1st Phalanx | | | Medium | Adult |
| BP/3/22757 | *papio sp* | Humerus | head | L | Medium | Juvenile |
| BP/3/22758 | *Cercopithecoidea indet* | Femur | prox. | R | Medium | Adult |
| BP/3/22763 | *Cercopithecoidea indet* | Tibia | dist. | L | Small | Adult |
| BP/3/22771 | *Cercopithecoidea indet* | Ulna | prox. | R | Small | Adult |
| BP/3/22773 | *Cercopithecoidea indet* | Humerus | shaft | R | small | Juvenile |
| BP/3/22775 | *Cercopithecoidea indet* | 1st Metatarsal | | R | Medium | Adult |
| BP/3/22776 | *Cercopithecoidea indet* | Second Metatarsal | | R | Medium | Adult |
| BP/3/22777 | *Cercopithecoidea indet* | 5th metacarpal | | R | Small | Adult |
| BP/3/22819 | *Cercopithecoidea indet* | Metapodial | condyle | | Small | Adult |
| BP/3/22829 | *Cercopithecoidea indet* | Metapodial | | | Small | Adult |
| BP/3/22842 | *Cercopithecoidea indet* | Carpal | | | Small | Adult |
| BP/3/22844 | *Cercopithecoidea indet* | Sternum | frag | | Medium | Adult |
| BP/3/22850 | *Cercopithecoidea indet* | Femur | shaft | L | Small | Adult |
| BP/3/22857 | *Cercopithecoidea indet* | Humerus | Proximal fragment | R | Small | Adult |
| BP/3/22865 | *Cercopithecoidea indet* | Third Metacarpal | | R | Medium | Adult |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/22872 | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| BP/3/23154 | *Cercopithecoidea indet* | 5th metatarsal | Distal and shaft | L | Medium | Adult |
| BP/3/23191 | *Cercopithecoidea indet* | Radius | shaft | | Small | Adult |
| BP/3/23232 | *Cercopithecoidea indet* | Radius | Shaft Fr | ? | Medium | adult |
| BP/3/23235 | *Papionina* | Radius | Proximal | R | Medium | Adult |
| BP/3/23237 | *Cercopithecoidea indet* | Radius | shaft | | Small | Adult |
| BP/3/23253 | *Cercopithecoidea indet* | Vertebra | Axis | | Small | Adult |
| BP/3/23257 | *Papio* | Ulna | prox. | R | Medium | adult |
| BP/3/23259 | *Cercopithecoidea indet* | Sacrum | Vertebra | | Medium | Adult |
| BP/3/23271 | *Papio/Parapapio* | Ulna | prox | L | Medium | Adult |
| BP/3/23272 | *Cercopithecoidea indet* | 2nd metatarsal | | L | Medium | Adult |
| BP/3/23293 | *Cercopithecoidea indet* | Metapodial | | | Medium | Adult |
| BP/3/23315 | *Cercopithecoidea indet* | Pelvis | Ilium | L | Large | Adult |
| BP/3/23331 | *Cercopithecoidea indet* | Pelvis | Acetabulum | ? | Medium | Adult |
| BP/3/23336 | *Papio/Parapapio* | Ulna | Proximal | L | Medium | Adult |
| BP/3/23357 | *Papio/Parapapio* | Ulna | Prox | ? | Medium | Adult |
| BP/3/23380 | *Cercopithecoidea indet* | Femur | lesser trochanter | R | Medium | Adult |
| BP/3/23389 | *Papio* | Humerus | Distal and shaft | L | Small | Adult |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/23421 | *Cercopithecoidea indet* | Humerus | distal condyles | R | Small | Adult |
| BP/3/23428 | *Cercopithecoidea indet* | Humerus | dist. | L | Small | Adult |
| BP/3/23453 | *Papio* | Radius | proximal | L | medium | Adult |
| BP/3/23585 | *Cercopithecoidea indet* | Clavicle | | | Small | Adult |
| BP/3/23648 | *Cercopithecoidea indet* | Femur | head | ?R | Medium | Adult |
| BP/3/23652 | *Cercopithecoidea indet* | Rib | head | | Small | Adult |
| BP/3/23653 | *Cercopithecoidea indet* | Palmar distal phalanx | Complete | ? | Medium | Adult |
| BP/3/23655 | *Cercopithecoidea indet* | palmar distal phalange | | ?L | Small | Adult |
| BP/3/23665 | *Cercopithecoidea indet* | 1st Phalanx | | | Small | Adult |
| BP/3/23672 | *Cercopithecoidea indet* | metapodial | | | Medium | Adult |
| BP/3/23681 | *Cercopithecoidea indet* | Femur | prox | L | Small | Adult |
| BP/3/23684 | *Cercopithecoidea indet* | Humerus | dist. | R | Medium | Adult |
| BP/3/23689 | *Cercopithecoidea indet* | 1st Phalanx | | | Small | Adult |
| BP/3/23692 | *Cercopithecoidea indet* | Thoracic Vertebra | | | Medium | Adult |
| BP/3/23694 | *Cercopithecoidea indet* | Tibia | dist. | R | Medium | Adult |
| BP/3/23700 | *Cercopithecoidea indet* | Scapula | | R | Small | Adult |
| BP/3/23710 | *Cercopithecoidea indet* | Femur | prox. | L | Medium | Adult |
| BP/3/23715 | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/23718 | *Papionina* | Ulna | Proximal | R | medium | adult |
| BP/3/23720 | *Cercopithecoidea indet* | Radius | Proximal shaft | L | Medium | Adult |
| BP/3/23724 | *Cercopithecoidea indet* | Pelvis | ilio-pubis ramus | L | medium | adult |
| BP/3/23733 | *Cercopithecoidea indet* | Intermediate hand phalange | Proximal and shaft | R | medium | adult |
| BP/3/23734 | *Cercopithecoidea indet* | Lumbar Vertebra | | | Small | Adult |
| BP/3/23737 | *Cercopithecoidea indet* | 4th metatarsal | | | Medium | Adult |
| BP/3/23741 | *Cercopithecoidea indet* | Ulna | proximalfr | L | Small | Adult |
| BP/3/23742 | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Small | Adult |
| BP/3/23746 | *Cercopithecoidea indet* | 1st Phalanx | | | Medium | Adult |
| BP/3/23860 | *Cercopithecoidea indet* | 1st Phalanx | | | Medium | Adult |
| BP/3/23890 | *Cercopithecoidea indet* | Proximal foot phalanx | complete | ?R | Small | Adult |
| BP/3/23891 | *Cercopithecoidea indet* | phalanx II | | | Small | Adult |
| BP/3/23903 | *Cercopithecoidea indet* | Fibula | shaft | ? | Small | Adult |
| BP/3/23954 | *Cercopithecoidea indet* | palmar intermediate 5th phalange | | | Small | Adult |
| BP/3/31153 | *Cercopithecoidea indet* | Radius | Proximal fragment | ? | Medium | adult |
| BP/3/31170 | *Cercopithecoidea indet* | Ulna | shaft | | Medium | Adult |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/31174 | *Cercopithecoidea indet* | Femur | shaft | ? | Small | Adult |
| BP/3/31175 | *Papio/Parapapio* | Ulna | prox. | R | Small | Adult |
| BP/3/31221 | *Cercopithecoidea indet* | 5th intermediate palmar phalanx | | R | small | Juvenile |
| BP/3/31251 | *Cercopithecoidea indet* | Distal palmar phalanx | | ? | Small | Adult |
| BP/3/31257 | *Cercopithecoidea indet* | Tibia | dist. | L | Medium | Adult |
| BP/3/31274 | *Cercopithecoidea indet* | Fibula | shaft | ? | Small | ? |
| BP/3/31282 | *Cercopithecoidea indet* | Ulna | shaft | | Medium | Adult |
| BP/3/31305 | *Cercopithecoidea indet* | Cervical Vertebra | body | - | small | |
| BP/3/31312 | *Cercopithecoidea indet* | Metacarpal | complete | R | small | |
| BP/3/31354 | *Cercopithecoidea indet* | Radius | shaft | ? | Medium | Adult |
| BP/3/31362 | *Cercopithecoidea indet* | Vertebraebrae | body | | small | Sub-adult |
| BP/3/31380 | *Cercopithecoidea indet* | 1st Phalanx | | | small | |
| BP/3/31381 | *Cercopithecoidea indet* | Metapodial | Proximal | ? | Medium | Adult |
| BP/3/31382 | *Cercopithecoidea indet* | Radius | shaft | | Medium | Adult |
| BP/3/31384 | *Cercopithecoidea indet* | 2nd metatarsal | base | R | Medium | Adult |
| BP/3/31388 | *Cercopithecoidea indet* | Radius | shaft | ?R | Medium | Adult |
| BP/3/31389 | *Cercopithecoidea indet* | Talus | complete | L | small | |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/31390 | *Cercopithecoidea indet* | Clavicle | complete | R | Medium | Adult |
| BP/3/31423 | *Cercopithecoidea indet* | Fibula | shaft | | Small | |
| BP/3/31436 | *Cercopithecoidea indet* | phalange | distal | ? | Medium | Adult |
| BP/3/31457 | *Cercopithecoidea indet* | Navicular | complete | R | Medium | Adult |
| BP/3/31458 | *Cercopithecoidea indet* | Cervical Vertebra | | | small | |
| BP/3/31494 | *Cercopithecoidea indet* | Tibia | Distal | ?R | Medium | Adult |
| BP/3/31525 | *Cercopithecoidea indet* | palmar intermediate phalange | complete | L | Medium | Adult |
| BP/3/31527 | *Cercopithecoidea indet* | Plantar distal phalange | | | Medium | Adult |
| BP/3/31529 | *Cercopithecoidea indet* | metapodial | DIStal | ? | Small | Sub-adult |
| BP/3/31550 | *Cercopithecoidea indet* | Metapodial | DISTAL FR | | Medium | Adult |
| BP/3/31553 | *Papionina* | Radius | Proximal | L | medium | Juvenile |
| BP/3/31578 | *Cercopithecoidea indet* | Ulna | distal | R | Medium | Adult |
| BP/3/31590 | *Cercopithecoidea indet* | thoracic Vertebra | centrum | | Large | Adult |
| BP/3/31596 | *Cercopithecoidea indet* | Pelvis | ILuim | ? | Medium | Adult |
| BP/3/31629 | *Cercopithecoidea indet* | 5th metacarpal | Distal and shaft | R | Small | Adult |
| BP/3/31643 | *Cercopithecoidea indet* | Ulna | shaft | ?R | Small | Adult |
| BP/3/31647 | *Cercopithecoidea indet* | Femur | distal condyle fr | R | Small | juvenile |

| Specimen no | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|
| BP/3/31651 | *Cercopithecoidea indet* | Rib | | | Small | Adult |
| BP/3/31653 | *Cercopithecoidea indet* | Femur | dist. | L | Small | Adult |
| BP/3/31661 | *Cercopithecoidea indet* | talus | complete | R | Small | sub-adult |
| BP/3/31686 | *Cercopithecoidea indet* | Humerus | shaft | R | Small | Sub-adult |
| BP/3/31691 | *Papio* | Humerus | distal | R | Medium | Sub-adult |
| BP/3/31697 | *Cercopithecoidea indet* | Scapula | Glenoid cavity | L | Small | sub-adult |
| BP/3/31715 | *Cercopithecoidea indet* | 5th metacarpal | complete | R | Medium | sub-adult |
| BP/3/31716 | *Cercopithecoidea indet* | Fibula | shaft | ? | Small | ? |
| BP/3/31735 | *Cercopithecoidea indet* | Tibia | dist. | L | Medium | Adult |
| BP/3/31800 | *Cercopithecoidea indet* | 4th metacarpal | | L | Small | Adult |
| BP/3/31805 | *Cercopithecoidea indet* | Lateral cuneiform | complete | R | Small | Adult |
| BP/3/31816 | *Cercopithecoidea indet* | Radius | prox | R | Small | Adult |
| BP/3/31829 | *Papio sp* | Humerus | prox | L | Small | Adult |
| BP/3/31837 | *Cercopithecoidea indet* | 2nd metacarpal | | L | Small | Adult |
| BP/3/31872 | *Cercopithecoidea indet* | Humerus | capitulim | L | Small | Adult |
| BP/3/31905 | *Cercopithecoidea indet* | Femur | shaft | ? | Small | Adult |
| BP/3/31910 | *Cercopithecoidea indet* | thoracic Vertebra | | | Small | Adult |

| | | | | | | |
|---|---|---|---|---|---|---|
| BP/3/31922 | *Cercopithecoidea indet* | Radius | shaft | L | Small | Adult |
| BP/3/31923 | *Papio sp* | Radius | prox | R | Medium | Adult |
| BP/3/31945 | *Cercopithecoidea indet* | Navicular | | L | Medium | Adult |
| BP/3/31960 | *Cercopithecoidea indet* | Scapula | glenoid | R | Small | Adult |
| BP/3/32006 | *Cercopithecoidea indet* | 1st phalanx | | | Small | Adult |
| BP/3/32007 | *Cercopithecoidea indet* | 1st phalanx | | | Small | Adult |
| BP/3/32008 | *Cercopithecoidea indet* | 1st phalanx | | | Small | Adult |
| BP/3/32009 | *Cercopithecoidea indet* | 2nd metatarsal | complete | R | medium | Juvenile |
| BP/3/32045 | *Cercopithecoidea indet* | Ulna | shaft | | Small | Adult |
| BP/3/32046 | *Cercopithecoidea indet* | 1st metatarsal | | L | Medium | Adult |
| BP/3/32047 | *Cercopithecoidea indet* | 2nd metatarsal | | L | Small | Adult |
| BP/3/32111 | *Cercopithecoidea indet* | Clavicle | shaft | ? | Medium | Adult |
| BP/3/32130 | *Cercopithecoidea indet* | Ulna | shaft | | Medium | Adult |
| BP/3/32139 | *Cercopithecoidea indet* | Humerus | dist. | L | Small | Adult |
| BP/3/32151 | *Cercopithecoidea indet* | Internal cuneiform | | L | Medium | Adult |
| BP/3/32167 | *Cercopithecoidea indet* | Ulna | shaft | | Medium | Adult |
| BP/3/32194 | *Cercopithecoidea indet* | Navicular | | R | Small | Adult |
| BP/3/32206 | *Cercopithecoidea indet* | Scapula | | R | Medium | Adult |
| BP/3/32211 | *Cercopithecoidea indet* | Humerus | shaft | R | Small | Juvenile |
| BP/3/32221 | *Cercopithecoidea indet* | Fibula | dist. | L | Medium | Adult |

| | | | | | | |
|---|---|---|---|---|---|---|
| BP/3/32239 | *Cercopithecoidea indet* | 5th metacarpal | | L | Medium | Adult |
| BP/3/3119 | *Cercopithecoidea indet* | Scapula | Blade | ? | Medium | Adult |

Table A2. Catalogue of specimens derived from Silberberg Grotto

| Specimen no | Provenance | Taxon | Element | Portion | Side | Size |
|---|---|---|---|---|---|---|
| S94-7211 | D20 | *Cercopithecoidea indet* | Talus | complete | R | Medium |
| SWP 920 | D20 | *Cercopithecoidea indet* | Humerus | distal shaft | ? | Medium |
| SWP 921 | D20 | *Cercopithecoidea indet* | Humerus | shaft | ? | Medium |
| SWP 1?85 | D20 | *Papio/Parapapio* | Femur | prox | L | Medium |
| SWP 1303 | D20 | *Cercopithecoidea indet* | Femur | Proximal | R | Medium |
| SWP 1365 | D20 | *Cercopithecoidea indet* | Tibia | Distal | R | Large |
| SWP 1367 | D20 | *Cercopithecoidea indet* | Femur | distal shaft | ? | Medium |
| SWP 1368 | D20 | *Papio/Parapapio* | Radius | Proximal | L | Medium |
| SWP 1383 | D20 | *Cercopithecoidea indet* | Femur | Proximalfr | R | Medium |
| SWP 1384 | D20 | *Papionina* | Femur | Proximal | R | Medium |
| SWP 1385 | D20 | *Papio/Parapapio* | Femur | Proximal | L | Medium |
| SWP 1386 | D20 | *Cercopithecoidea indet* | Humerus | distal | ? | Medium |
| SWP 1387 | D20 | *Cercopithecoidea indet* | Tibia | Proximal fr | ? | Medium |
| SWP 1388 | D20 | *Cercopithecoidea indet* | Humerus | Distal | | Medium |
| SWP 1390 | D20 | *Cercopithecoidea indet* | Talus | complete | R | medium |
| SWP 1391 | D20v | *Cercopithecoidea indet* | Calcaneus | | R | Medium |
| SWP 1403 | D20 | *Cercopithecoidea indet* | Ulna | distal | L | Medium |
| SWP 1404 | D20 | *Cercopithecus sp* | Femur | Proximal | R | Medium |
| SWP 1405 | D20 | *Cercopithecoidea indet* | Ulna | Distal shaft | R | Medium |
| SWP 1406 | D20 | *Papio* | Humerus | Proximal | R | Medium |
| SWP 1408 | D20 | *Cercopithecoidea indet* | Metapodial | Proximal | ? | Medium |
| SWP 1410 | D20 | *Papio/Parapapio* | Humerus | Distal | L | Medium |
| SWP 1411 | D20 | *Cercopithecoidea indet* | Tibia | Proximal | ? L | Medium |
| SWP 1414 | D20 | *Cercopithecoidea indet* | Femur | Proximal | L | Medium |
| SWP 1416 | D20 | *Papionina* | Radius | Proximal | R | Large |
| SWP 1418 | D20 | *Papio* | Radius | Proximal | R | Medium |
| SWP 1419 | D20 | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium |
| SWP 1420 | D20 | *Cercopithecoidea indet* | Radius | Proximal shaft | ? | Medium |
| SWP 1532 | D20 | *Papionina* | Femur | Distal | R | Medium |
| **Specimen no** | **Provenance** | **Taxon** | **Element** | **Portion** | **Side** | **Size** |
| SWP 1533 | D20 | *Cercopithecoidea indet* | Femur | shaft | ? | Medium |

| | | | | | | |
|---|---|---|---|---|---|---|
| SWP 1534 | D20 | *Papionina* | Femur | Distal | L | Large |
| SWP 1535 | D20 | *Cercopithecoidea indet* | Femur | Distal | R | Medium |
| SWP 1536 | D20 | *Papionina* | Femur | Proximal shaft | R | Large |
| SWP 1537 | D20 | *Papionina* | Femur | Proximal shaft | L | Medium |
| SWP 1538 | D20 | *Cercopithecoidea indet* | Humerus | Proximal shaft | ? | Medium |
| SWP 1539 | D20 | *Papionina* | Humerus | capitulum | R | Medium |
| SWP 1540 | D20 | *Parapapio* | Humerus | distal | L | Medium |
| SWP 1541 | D20 | *Cercopithecoidea indet* | Humerus | distal | ? | medium |
| SWP 1542 | D20 | *Cercopithecoidea indet* | Humerus | head fr | L | Medium |
| SWP 1543 | D20 | *Papionina* | Humerus | Capitulum and trochlea | L | Medium |
| SWP 1544 | D20 | *Papionina* | Humerus | Distal fr | ? | Medium |
| SWP 1545 | D20 | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium |
| SWP 1546 | D20 | *Cercopithecoidea indet* | Tibia | Proximal | L | Medium |
| SWP 1547 | D20 | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium |
| SWP 1547 | D20 | *Cercopithecoidea indet* | Radius | Distal | ? | Medium |
| SWP 1548 | D20 | *Cercopithecoidea indet* | Tibia | Proximal fragment | L | Medium |
| SWP 1550 | D20 | *Cercopithecoidea indet* | Metapodial | Distal shaft | ? | Medium |
| SWP 1552 | D20 | *Papio* | Radius | proximal | R | Medium |
| SWP 1554 | D20 | *Cercopithecoidea indet* | Ulna | shaft | ? | Medium |
| SWP 1555 | D20 | *Cercopithecoidea indet* | Radius | shaft fragment | ? | Medium |
| SWP 1556 | D20 | *Cercopithecoidea indet* | Radius | Shaft fragment | ? | Medium |
| SWP 1557 | D20 | *Cercopithecoidea indet* | Radius | Shaft fragment | ? | Medium |
| SWP 1560 | D20 | *Papionina* | Ulna | Proximal | L | Medium |
| SWP 1561 | D20 | *Papionina* | Ulna | Proximal | R | Medium |
| SWP 1562 | D20 | *Cercopithecoidea indet* | Ulna | proximal | R | Medium |
| SWP 1566 | D20 | *Papionina* | Ulna | Proximal | L | Medium |
| SWP 1581 | D20 | *Papionina* | Humerus | Distal | L | Medium |
| SWP 1582 | D20 | *Parapapio/Papio* | Humerus | Distal | R | Medium |
| SWP 1583 | D20 | *Papionina* | Humerus | Distal | L | Medium |
| SWP 1584 | D20 | *Papio* | Humerus | distal | R | Medium |
| SWP 1585 | D20 | *Cercopithecoidea indet* | Humerus | Distal and prox fragment | R | Medium |

| Specimen no | Provenance | Taxon | Element | Portion | Side | Size |
|---|---|---|---|---|---|---|
| SWP 1586 | D20 | *Cercopithecoidea indet* | Humerus | Distal | R | Small |
| SWP 1587 | D20 | *Cercopithecoidea indet* | Humerus | Distal | | Medium |
| SWP 1588 | D20 | *Cercopithecoidea indet* | Humerus | Distal shaft | ? | Small |
| SWP 1589 | D20 | *Parapapio* | Humerus | Distal | L | Medium |
| SWP 1590 | D20 | *Papio/Parapapio* | Ulna | Proximal | R | Medium |
| SWP 1591 | D20 | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium |
| SWP 1592 | D20 | *Cercopithecoidea indet* | Ulna | Shaft | L | Medium |
| SWP 1593 | D20 | *Cercopithecoidea indet* | Ulna | Distal shaft | L | Small |
| SWP 1593 | D20 | *Cercopithecoidea indet* | Ulna | Proximal fr | ? | Medium |
| SWP 1594 | D20 | *Papio/Parapapio* | Ulna | Proximal | L | Small |
| SWP 1595 | D20 | *Cercopithecoidea indet* | Ulna | Shaft | L | Large |
| SWP 1597 | D20 | *Cercopithecoidea indet* | Tibia | Proximal | L | Medium |
| SWP 1598 | D20 | *Cercopithecoidea indet* | Tibia | Proximal | ? | Medium |
| SWP 1601 | D20 | *Cercopithecoidea indet* | Tibia | Distal | L | Medium |
| SWP 1602 | D20 | *Cercopithecoidea indet* | Tibia | Distal | L | Medium |
| SWP 1603 | D20 | *Cercopithecoidea indet* | Tibia | Distal | L | Medium |
| SWP 1604 | D18 | *Papionina* | Ulna | proximal | R | Large |
| SWP 1605 | D20 | *Cercopithecoidea indet* | Femur | Distal | L | Large |
| SWP 1606 | D20 | *Cercopithecoidea indet* | Femur | Head | R | Medium |
| SWP 1607 | D20 | *Cercopithecoidea indet* | Femur | Distal | L | Medium |
| SWP 1608 | D20 | *Cercopithecoidea indet* | Femur | Distal | L | Medium |
| SWP 1609 | D20 | *Cercopithecoidea indet* | Femur | Condyles | L | Medium |
| SWP 1610 | D20 | *Cercopithecoidea indet* | femur | distal condyles | L | Medium |
| SWP 1611 | D20 | *Cercopithecoidea indet* | Humerus | proximal | R | Medium |
| SWP 1612 | D20 | *Cercopithecoidea indet* | Femur | proximal | L | Medium |
| SWP 1613 | D20 | *Cercopithecoidea indet* | Femur | Head | L | medium |
| SWP 1614 | D20 | *Cercopithecoidea indet* | femur | Head | ? | Medium |
| SWP 1615 | D20 | *Cercopithecoidea indet* | Femur | Head | ? | Medium |
| SWP 1616 smudged | D20 | *Cercopithecoidea indet* | Femur | Proximal | ? | Medium |
| SWP 1617 | D20 | *Cercopithecoidea indet* | Femur | Proximal | R | Small |
| SWP 1618 | D20 | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium |
| SWP 1619 | D20 | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium |
| SWP 1620 | D20 | *Cercopithecoidea indet* | Calcaneus | complete | ? | Medium |

| Specimen no | Provenance | Taxon | Element | Portion | Side | Size |
|---|---|---|---|---|---|---|
| SWP 1621 | D20 | *Cercopithecoidea indet* | 1st phalanx | complete | ? | Medium |
| SWP 1622 | D20 | *Cercopithecoidea indet* | Phalanx | Distal | ? | Medium |
| SWP 1623 | D20 | *Cercopithecoidea indet* | Metapodial | shaft | ? | Medium |
| SWP 1625 | D20 | *Cercopithecoidea indet* | Long bone | shaft | ? | Small |
| SWP 1626 | D20 | *Cercopithecoidea indet* | Talus | complete | L | Medium |
| SWP 1627 | D20 | *Cercopithecoidea indet* | Calcaneus | complete | L | Medium |
| SWP 1628 | D20 | *Cercopithecoidea indet* | Phalanx | Complete | ? | Medium |
| SWP 1630 | D20 | *Cercopithecoidea indet* | Pelvis | Os coxa fr | L | Medium |
| SWP 1631 | D20 | *Cercopithecoidea indet* | Pelvis | Fragment | ? | Medium |
| SWP 1633 | D20 | *Cercopithecoidea indet* | Pelvis | Fragment | ? | Medium |
| SWP 1634 | D20 | *Cercopithecoidea indet* | Pelvis | Acetabulum | ? | Medium |
| SWP 1635 | D20 | *Cercopithecoidea indet* | Pelvis | Fragment | ? | Medium |
| SWP 1636 | D20 | *Cercopithecoidea indet* | Pelvis | Ilium | ? | Medium |
| SWP 1697 | D20 | *Theropithecus sp* | Femur | prox | R | Medium |
| SWP 1698 | D20 | *Papio/Parapapio* | Femur | prox | L | Medium |
| SWP 1699 | D20 | *Papionina* | Femur | prox | L | Medium |
| SWP 1700 | D20 | *Papio/Parapapio* | Femur | Proximal fr | L | Medium |
| SWP 1701 | D20 | *Cercopithecoidea indet* | Femur | head | R | Medium |
| SWP 1702 | D20 | *Cercopithecoidea indet* | Femur | head | L | Medium |
| SWP 1703 | D20 | *Cercopithecoidea indet* | Femur | head | ? | Medium |
| SWP 1704 | D20 | *Papionina* | Femur | Prox | R | Medium |
| SWP 1705 | D20 | *Cercopithecoidea indet* | Femur | Proximal | L | Medium |
| SWP 1706 | D20 | *Papionina* | Femur | Shaft | L | Medium |
| SWP 1707 | D20 | *Cercopithecoidea indet* | Femur | Proximal | ? | Medium |
| SWP 1708 | D20 | *Cercopithecoidea indet* | Femur | Proximal fragment | ? | Medium |
| SWP 1709 | D20 | *Cercopithecoidea indet* | Femur | Proximalfr | L | Medium |
| SWP 1711 | D20 | *Cercopithecoidea indet* | femur | Distal | L | Medium |
| SWP 1712 | D20 | *Cercopithecoidea indet* | Femur | distal condyles | R | Medium |
| SWP 1713 | D20 | *Cercopithecoidea indet* | Femur | distal condyles | ? | Medium |
| SWP 1714 | D20 | *Cercopithecoidea indet* | Femur | distal condyles | R | Large |
| SWP 1715 | D20 | *Cercopithecoidea indet* | Femur | distal condyles | R | Medium |
| SWP 1716 | D20 | *Cercopithecoidea indet* | Femur | Distal | ? | Medium |

| Specimen no | Provenance | Taxon | Element | Portion | Side | Size |
|---|---|---|---|---|---|---|
| SWP 1717 | D20 | *Cercopithecoidea indet* | Femur | distal condyles | R | Medium |
| SWP 1718 | D20 | *Cercopithecoidea indet* | Femur | distal condyles | ? | Medium |
| SWP 1719 | D20 | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium |
| SWP 1720 | D20 | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium |
| SWP 1721 | D20 | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium |
| SWP 1722 | D20 | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium |
| SWP 1724 | D20 | *Cercopithecoidea indet* | Femur | Distal | | Medium |
| SWP 2349 | D20 | *Cercopithecoidea indet* | Pelvis | Acetabulum | R | Medium |
| SWP 2351 | D20 | *Cercopithecoidea indet* | Pelvis | Fragment | ? | Medium |
| SWP 2352 | D20 | *Cercopithecoidea indet* | Pelvis | Ilium | ? | Medium |

Table A3. Catalogue of specimens derived from Member 4

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| BP/3/16533 | O43 | 24'10"-25'10" | *Cercopithecoidea indet* | Pelvis | Ilium | R | Medium | Adult |
| BP/3/16554 | O43 | 24'10"-25'10" | *Cercopithecoidea indet* | Pelvis | Ilium | ? | Small | Adult |
| BP/3/16617 | O40 | 12'0'-13'0' | *Cercopithecoidea indet* | Femur | Shaft | | Small | Adult |
| BP/3/16624 | O42 | 16'4'-17'-4' | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| BP/3/16635 | O46 | 21'10-22'10' | *Cercopithecoidea indet* | Vertebraebrae | Lumbar | | Small | Adult |
| BP/3/16652 | O42 | ? | *Cercopithecoidea indet* | Humerus | Condyle | ? | Small | Adult |
| BP/3/16793 | O46 | 28'10"-29'10" | *Cercopithecoidea indet* | Scapula | Glenoid cavity | R | Medium | Adult |
| BP/3/16816 | O46 | 26'10'-27'10' | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| BP/3/16847 | O46 | 26'10'-27'10' | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| BP/3/17757 | R42 | 32'8'-33'8' | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| BP/3/17789 | R45 | 36'3'-37'3' | *Cercopithecoidea indet* | Humerus | Proximal | R | Medium | Adult |
| BP/3/23004 | P46 | 16'5'-17'5' | *Cercopithecoidea indet* | Humerus | Shaft | R | Small | Adult |
| BP/3/23008 | P43 | 10'2'-11'6' | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| BP/3/23009 | P42 | 11'11'-12'6' | *Cercopithecoidea indet* | Talus | Complete | L | Medium | Adult |
| BP/3/23016 | P42 | 12’6’-13’-1” | *Papio/Parapapio* | Humerus | Distal condyles | L | Small | Adult |
| BP/3/23021 | P45 | 14'4'-15'8' | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| BP/3/23022 | P45 | 14'4'-15'8' | *Cercopithecoidea indet* | Pelvis | Acetabulum | L | Medium | Adult |
| BP/3/23023 | P45 | 14'4'-15'8' | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| BP/3/23028 | P44 | 14'5-15'1' | *Papionina* | Ulna | Proximal | L | Small | Adult |
| BP/3/23029 | P44 | 14'5'-15'1' | *Cercopithecoidea indet* | Talus | Complete | L | Medium | Adult |
| BP/3/23048 | P44 | 8'7'-9'7' | *Cercopithecoidea indet* | 1st metatarsal | Prox | R | Medium | Adult |
| BP/3/23049 | P44 | 8'7'-9'7' | *Cercopithecoidea indet* | Pelvis | Iluim | L | Medium | Adult |
| BP/3/23059 | P43 | 8'3'-9'3' | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| BP/3/2306 | | | *Papio/Parapapio* | Humerus | Distal | L | Small | Adult |
| BP/3/23064 | P44 | 17"11'-18'11 | *Cercopithecoidea indet* | 2nd metatarsal | Proximal | L | Medium | Adult |
| BP/3/23067 | N46 | 13'5'-14'5' | *Cercopithecoidea indet* | Pelvis | Os coxa | L | Medium | Adult |
| BP/3/23070 | P44 | 15'1'-16'1' | *Cercopithecoidea indet* | Fibula | Shaft | ? | Medium | Adult |
| BP/3/23071 | P44 | | *Cercopithecoidea indet* | Metapodial | Dist | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| BP/3/23072 | P44 | 15'1'-16'1' | *Cercopithecoidea indet* | Sternum | Body | | Small | Adult |
| BP/3/23074 | P44 | 8'11'-9'11' | *Cercopithecoidea indet* | Femur | Head | ? | Small | Juvenile |
| BP/3/23088 | N46 | 16'5"-17'5" | *Cercopithecoidea indet* | 1st metatarsal | Head | L | Medium | Adult |
| BP/3/23090 | N46 | 16'5'-17'5' | *Cercopithecoidea indet* | Calcaneus | Head | L | Medium | Adult |
| BP/3/23091 | N46 | 16'5'-17'5' | *Papio sp* | Radius | Shaft | L | Medium | Adult |
| BP/3/23092 | N46 | 16'5'-17'5' | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| BP/3/23093 | N46 | 16'5'-17'5' | *Papionina* | Ulna | Head | L | Medium | Adult |
| BP/3/23112 | P41 | 10'6'-11'3' | *Cercopithecoidea indet* | 5th metatarsal | Proximal | R | Medium | Adult |
| BP/3/23113 | P41 | 10'6'-11'3' | *Cercopithecoidea indet* | 4th metatarsal | Head | L | Medium | Adult |
| BP/3/23115 | P44 | | *Cercopithecoidea indet* | 1st metatarsal | Proximal and shaft | ? | | Adult |
| BP/3/23119 | ? | ? | *Cercopithecoidea indet* | 2nd phal | Complete | R | Medium | Adult |
| BP/3/23120 | P32 | 9'9'-10'1' | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| BP/3/23121 | P32 | 9'9'-10'1' | *Cercopithecoidea indet* | Femur | Shaft | L | Medium | Adult |
| BP/3/23126 | W44 | | *Cercopithecoidea indet* | Scapula | Glenoid | R | Small | Adult |
| BP/3/23141 | W43 | ? | *Cercopithecoidea indet* | Vertebra | Atlas fr | | Small | Adult |
| BP/3/23143 | W43 | ? | *Cercopithecoidea indet* | Manus phal | Distal | ? | Medium | Adult |
| BP/3/23145 | T44 | 30'5'-31'5' | *Cercopithecoidea indet* | 4th metatarsal | Proximal | L | Medium | Adult |
| BP/3/23955 | N43 | 13'9'-14'9' | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| BP/3/23958 | N43 | 13'9'-14'9' | *Cercopithecoidea indet* | Pelvis | Ilium | | Medium | Adult |
| BP/3/23959 | N43 | 13'9'-14'9' | *Cercopithecoidea indet* | Scapula | Glenoid cavity | R | Medium | Adult |
| BP/3/23964 | N46 | 21'9'-22'9' | *Cercopithecoidea indet* | 5th metatarsal | Prox. | R | Small | Adult |
| BP/3/23966 | O44 | | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| BP/3/23970 | O46 | 29"10'-30'10' | *Cercopithecoidea indet* | Pelvis | Ilium blade | R | Medium | Adult |
| BP/3/23979 | | | *Cercopithecoidea indet* | Cerv Vertebra | Spine and body | | Medium | Adult |
| BP/3/23980 | P44 | 30' 7" - 31' 7" | *Cercopithecoidea indet* | 4rth metatarsal | Proximal | R | Medium | Adult |
| BP/3/23984 | O44 | 30' 7" - 31' 7" | *Cercopithecoidea indet* | Talus | Complete | L | Small | Adult |
| BP/3/24000 | N46 | 17'5"-18'0" | *Papio* | Humerus | Distal | L | Small | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| BP/3/24003 | N44 | 15'8'-16'6' | *Cercopithecoidea indet* | proximal phal | Complete | L | Medium | Adult |
| BP/3/24004 | N44 | 15'8'-16'6' | *Cercopithecoidea indet* | Proximal phal | Complete | R | Medium | Adult |
| BP/3/24007 | N46 | 15'5'-16'5' | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| BP/3/24010 | N44 | 12'9"-13'8" | *Cercopithecoidea indet* | Talus | Complete | L | Medium | Adult |
| BP/3/24011 | S43 | 13' 10" - 14' 10" | *Cercopithecoidea indet* | 2nd metatarsal | Complete | R | Medium | Adult |
| BP/3/24014 | P43 | 35'0'-36'0' | *Cercopithecoidea indet* | Humerus | Head | ? | Small | Sub-adult |
| BP/3/24018 | S43 | 14'10'-151'0' | *Cercopithecoidea indet* | Ulna | Shaft | L | Medium | Adult |
| BP/3/24019 | S43 | 14'10'-151'0' | *Cercopithecoidea indet* | Pelvis | | L | Medium | Adult |
| BP/3/24023 | Q46 | 20'10"-21'10" | *Cercopithecoidea indet* | Scapula | Glenoid | L | Small | Adult |
| BP/3/24033 | Q44 | 9'3'-10'3' | *Cercopithecoidea indet* | Manus 2nd phalanx | Complete | L | Medium | Adult |
| BP/3/24037 | N44 | 13'8"-14'8" | *Cercopithecoidea indet* | Femur | Prox. | R | Medium | Adult |
| BP/3/24038 | N44 | 13'8'-14'8 | *Papio?* | Ulna | Shaft | L | Medium | Adult |
| BP/3/24042 | N45 | 16'8'-17'8' | *Cercopithecoidea indet* | Femur | Head | L | Medium | Adult |
| BP/3/24043 | N45 | 16'8'-17'8' | *Papio/Parapapio* | Radius | Head | L | Medium | Adult |
| BP/3/24050 | N44 | 11'9'-12'9' | *Cercopithecoidea indet* | 2nd phalanx | Complete | L | Small | Adult |
| BP/3/24051 | P42 | 36'0'-37'0' | *Cercopithecoidea indet* | Ulna | Shaft | R | Small | Adult |
| BP/3/24053 | P42 | 36'0'-37'0' | *Papio/Parapapio* | Humerus | Distal | R | Medium | Adult |
| BP/3/24055 | R43 | 14'3'-15'0' | *Cercopithecoidea indet* | Metapodial | | | Medium | |
| BP/3/24056 | R43 | ? | *Cercopithecoidea indet* | 2-5phal manus | ? | R | Medium | Adult |
| BP/3/24057 | R43 | 14' 3"- 15' 0" | *Cercopithecoidea indet* | 3rd metatarsal | Proximal | R | Medium | Adult |
| BP/3/24066 | 24'2-25'2' | S43 | *Cercopithecoidea indet* | Metapodial | Distal | | Medium | Adult |
| BP/3/24070 | N42 | 15'1'-16'1' | *Cercopithecoidea indet* | 2-5th pes phal | Proximal | L | Medium | Adult |
| S94-10344 | Q44 | 10'3'-11'3' | *Cercopithecoidea indet* | Femur | Medial | L | Medium | Adult |
| S94-10366 | Q44 | ? | *Cercopithecoidea indet* | Tibia | Shaft | ? | Small | Adult |
| S94-10431 | Q43 | ? | *Cercopithecoidea indet* | Patella | Complete | ? | Medium | Adult |
| S94-10431 | | | *Cercopithecoidea indet* | Patella | Complete | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| S94-10456 | Q48 | 9'2'-10'2' | *Cercopithecoidea indet* | Tibia | Shaft | | Medium | Adult |
| S94-10745 | S57 | ? | *Cercopithecoidea indet* | Tibia | Shaft | ? | Small | Adult |
| S94-10836 | S64 | N/a | *Cercopithecoides sp* | Ulna same as 13505 | Proximal | R | Small | Adult |
| S94-10852 | Q48 | 8'6'-9'6' | *Cercopithecoidea indet* | Tibia | Shaft | | Medium | Juvenile |
| S94-10864 | Q49 | 7' 0" - 8' 0" | *Cercopithecoidea indet* | Ulna | Shaft | R | Large | Adult |
| S94-10865 | Q49 | 7' 0" - 8' 0" | *Cercopithecoidea indet* | Ulna | Shaft | R | Large | Adult |
| S94-10936 | I39 | 20'5'-21'6' | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| S94-10937 | I39 | 20'5'-21'6' | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| S94-10951 | I40 | 22'6'-23'6' | *Cercopithecoidea indet* | Pelvis | Pubis | L | Medium | ? |
| S94-11408 | U47 | 11'5"-12'5" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| S94-11409 | U47 | 11'5"-12'5" | *Cercopithecoidea indet* | Femur | Proximal | ? | Medium | Adult |
| S94-11422 | U47 | 17'3'-18'3' | *Cercopithecoidea indet* | Pelvis | Ilium | R | Large | A |
| S94-11424 | U47 | 17'3'-18'3' | *Cercopithecoidea indet* | Ulna | Proximal | R | Large | Adult |
| S94-11626 | T43 | 26'11'-27'11' | *Cercopithecoidea indet* | Calcaneus | Head | L | Medium | Adult |
| S94-11638 | T43 | 27'11-28'11' | *Cercopithecoidea indet* | Int cuneiform | Complete | L | Medium | Adult |
| S94-11660 | T43 | 31'11'-32'11' | *Cercopithecoidea indet* | Femur | Distal | L | Medium | Adult |
| S94-12011 | P42 | 24'0'-25'0' | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| S94-12023 | P43 | 25' 0" - 26' 0" | *Cercopithecoidea indet* | Scapula | Coronoid and glenoid | R | Medium | Adult |
| S94-12054 | P44 | 22'9"-23'2" | *Cercopithecoidea indet* | Radius | Shaft | R | Medium | Adult |
| S94-12055 | P44 | 22'7'-23'7 | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| S94-12070 | P44 | 24'7'-25'7 | *Cercopithecoidea indet* | Humerus | Shaft | R | Medium | Adult |
| S94-12072 | P44 | 24'7'-25'7 | *Cercopithecoidea indet* | Radius | Shaft | L | Small | Adult |
| S94-12113 | P45 | ? | *Cercopithecoidea indet* | Thoracic Vertebra | Complete | | Medium | Adult |
| S94-12234 | R45 | 25'6'-26'6' | *Cercopithecoidea indet* | 1st metacarpal | Shaft | | Medium | Adult |
| S94-12266 | R49 | 17'1'017'6 | *Cercopithecoidea indet* | Ulna | Shaft | R | Small | Adult |
| S94-12290 | P40 | 11'8'-12'3' | *Cercopithecoidea indet* | Talus | Body | R | Small | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| S94-12306 | P41 | 16'5'-17'9' | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| S94-12325 | P47 | 19'1'-20'0 | *Cercopithecoidea indet* | Scapula | Glenoid | R | Small | Adult |
| S94-12384 | P43 | 17'0'-18'0' | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| S94-12485 | P44 | 29'7'-30'7' | *Cercopithecoidea indet* | Tibia | Proximal | R | Small | Juvenile |
| S94-1256 | H40 | 22'9'-23'5' | *Cercopithecoidea indet* | Sacrum | Body | | Medium | Adult |
| S94-12624 | | 15'4"-16'5" | *Cercopithecoidea indet* | Pelvis | Acetabulum | R | Medium | Adult |
| S94-12691 | P42 | 13'1'-14'1' | *Cercopithecoidea indet* | Patella | Complete | | Medium | Adult |
| S94-12692 | P42 | 13' 1" - 14' 1" | *Cercopithecoidea indet* | Pelvis | Ischium | L | Medium | Adult |
| S94-12728 | P44 | 7'7'-8'7' | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| S94-12750 | P44 | 14'5'-15'11 | *Cercopithecoidea indet* | Pelvis | Ilium | L | Large | Adult |
| S94-12824 | P47 | 15’4”-16’5” | *Cercopithecoidea indet* | Pelvis | Acetabulum | R | Medium | Adult |
| S94-12919 | R43 | 28'10"-29'10" | *Cercopithecoidea indet* | Pelvis | Ischium | R | Medium | Adult |
| S94-12922 | R43 | 30'10-31'10 | *Cercopithecoidea indet* | Vertebraebrae | Axis | | Medium | Adult |
| S94-13006 | R43 | 24’6”-25’6’ | *Cercopithecoidea indet* | Pelvis | Ilium fr | L | Medium | Adult |
| S94-13087 | O44 | 11'4-12'4' | *Cercopithecoidea indet* | Ulna | Shaft | ? | Large | Adult |
| S94-13088 | O44 | 11'4-12'4' | *Cercopithecoidea indet* | Tibia | Shaft | | Large | A |
| S94-13100 | O44 | 14'10-15'10 | *Cercopithecoidea indet* | Ulna | Shaft | R | Small | Adult |
| S94-13106 | O45 | 14'3'-15'8' | *Cercopithecoidea indet* | Pelvis | Ischium | R | Small | Adult |
| S94-13115 | O45 | 15'8-16'4' | *Cercopithecoidea indet* | Ulna | Shaft | L | Large | Adult |
| S94-13130 | O46 | 15'3'-16'3' | *Cercopithecoidea indet* | Thoracic Vertebra | Body n spine | | Medium | Adult |
| S94-13140 | O45 | 17'3'-18'3' | *Cercopithecoidea indet* | Femur | Distal | | Medium | Adult |
| S94-13151 | O46 | 17'3'-18'3' | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| S94-13152 | O46 | 17-'3"-18-'3" | *Papionina* | Ulna | Proximal | L | Small | Adult |
| S94-13215 | Q42 | 18'5'-19'5' | *Cercopithecoidea indet* | Pelvis | Ischium | R | Small | Adult |
| S94-13218 | Q42 | 18'5'-19'5' | *Cercopithecoidea indet* | Femur | Distal | R | Small | Adult |
| S94-13505 | L42 | 19' 0" - 20' 40" | *Cercopithecoides sp* | Ulna | Proximal | L | Large | Adult |
| S94-13515 | P32 | 9' 9" - 10' 1" | *Cercopithecoidea indet* | Femur | Shaft | L | Large | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| S94-13625 | U51 | 9'10'-10'10' | *Cercopithecoidea indet* | Pelvis | Ischium | R | Medium | Adult |
| S94-13626 | U51 | ? | *Cercopithecoidea indet* | Pelvis | Ischium | R | Medium | Adult |
| S94-13717 | O43 | 12'6'-13'9' | *Cercopithecoidea indet* | Humerus | Shaft | L | Medium | Adult |
| S94-13727 | O43 | 17' 10" - 18'10" | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| S94-13792 | O46 | 18'3'-19'8' | *Cercopithecoidea indet* | Radius | Distal | L | Medium | Adult |
| S94-13816 | O47 | 16'11'-17'11 | *Cercopithecoidea indet* | Humerus | Shaft | L | Medium | Adult |
| S94-13970 | Q46 | 28'6"-29'6" | *Cercopithecoidea indet* | Tibia | Shaft | ? | Medium | Adult |
| S94-14235 | S41 | 9'11'-12'11' | *Cercopithecoidea indet* | Scapula | Glenoid | R | Medium | Adult |
| S94-14238 | S41 | 9'11"-10'11" | *Cercopithecoidea indet* | Scapula | Glenoid | R | Medium | Adult |
| S94-14301 | S43 | 28'2'-29'2' | *Cercopithecoidea indet* | Pelvis | Acetabulum | R | Small | Adult |
| S94-14425 | S46 | 28'8'-29'3' | *Cercopithecoidea indet* | Pelvis | Ischium | R | Small | Adult |
| S94-1519 | W46 | 27'4'-28'4' | *Cercopithecoidea indet* | Femur | Shaft | | Small | Juvenile |
| S94-1520 | W46 | 27' 4" - 28' 4" | *Cercopithecoidea indet* | Thor Vertebra | Body | | Small | Juvenile |
| S94-1543 | W46 | 28'4'-29'4' | *Cercopithecoidea indet* | Lumbar Vertebra | Body | | Medium | Adult |
| S94-1775 | P45 | 13'-4'-14'4' | *Cercopithecoidea indet* | 1st phal | Complete | | Small | Adult |
| S94-2317 | P46 | 8"2'-9"2' | *Cercopithecoidea indet* | Ulna | Shaft | ? | Small | Adult |
| S94-2327 | P45 | 5'5'-6'5' | *Cercopithecoidea indet* | Humerus | Shaft | R | | Adult |
| S94-258 | V62 | 9'5"-10'5" | *Cercopithecoidea indet* | Navicular | Complete | L | Medium | Adult |
| S94-259 | V62 | 9'5"-10'5" | *Cercopithecoidea indet* | Navicular | Complete | L | Medium | Adult |
| S94-492 | U43 | 25'0'-26'0' | *Cercopithecoidea indet* | Lumbar Vertebra | Complete | | Medium | Adult |
| S94-8002 | Cc47 | 7' 2" - 8' 2" | *Cercopithecoidea indet* | Pelvis | Pubis | | Medium | Adult |
| S94-8835 | V48 | 4' 0"- 5' 10" | *Cercopithecoidea indet* | Cerv Vertebra | Complete | | Small | Adult |
| S94-8855 | V41 | 4'0'-5'0' | *Cercopithecoidea indet* | Calcaneus | Head | L | Medium | Adult |
| S94-9076 | V49 | ? | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| S94-9257 | N32 | ? | *Papionin* | Humerus | Proximal | L | Medium | Adult |
| S94-9291 | J42 | 22'5'-22'10' | *Cercopithecoidea indet* | Tibia | Proximal | R | Large | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| S94-9493 | V61 | 13'6"-14'7" | *Cercopithecoidea indet* | Lumbar Vertebra | Body | | Medium | Adult |
| Sf 1365 | Q43 | 8' 5" - 9" 5" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| Sf 1465 | Q42 | 11' 2" - 12' 10" | *Papionina* | Ulna | Proximal | R | Large | Adult |
| Sf 1551 | R 41 | 8'10"-9'10" | *Cercopithecoidea indet* | Femur | Shaft | L | Medium | Adult |
| Sf 1553 | R41 | 8'9"-9'10" | *Papionina* | Radius | Proximal | L | Medium | Adult |
| Sf 1654 | R41 | 9'10"-10"7" | *Cercopithecoidea indet* | Metapodial | Distal | | Medium | Adult |
| Sf 2567 | S45 | 22' 6" - 23' 6" | *?Colobinae* | Radius | Prox | L | Large | Adult |
| Sf 2689 | S46 | 22' 7" - 23' 7" | *Papionina* | Radius | Proximal | L | Small | Juvenile |
| Sf 3418 | T45 | 18' 6" - 19' 6" | *Theropithecus* | Ulna | Proximal | R | Very large | Adult |
| Sf 3484 | T45 | ? | *Papionina* | Radius | Proximal | R | Medium | Adult |
| Sf 4103 | T50 | 17' 10" - 18'10" | *Cercopithecoidea indet* | ? | ? | | Large | Adult |
| Sf 4116 | T50 | 21'10"-22'10" | *Cercopithecoidea indet* | Radius | Distal | L | Medium | Adult |
| Sf 4151 | T50 | 19'11"-20'11" | *Cercopithecoidea indet* | Ulna | Fr | | Medium | Adult |
| Sf 4217 | T39 | 6' 7" - 7' 7" | *Cercopithecoidea indet* | Radius | Distal with broken shaft | L | Medium | Adult |
| Sf 4218 | T39 | 6' 7" - 7' 7" | *Cercopithecoidea indet* | Scapula (?) | Fr | L | Medium | Adult |
| Sf 4219 | T39 | 6' 7" - 7' 7" | *Cercopithecoidea indet* | Scapula | Fr | ? | Medium | Adult |
| Sf 4232 | T52 | 13' 10" - 14' 10" | *Cercopithecoidea indet* | Scapula | Acromion process | L | Medium | Adult |
| Sf 4284 | U47 | 25'11"-26'11" | *Cercopithecoidea indet* | Ulna | Prox | R | Very large | Adult |
| Sf 4417 | U47 | 24'11"-25'11" | *Cercopithecoidea indet* | Radius | Shaft | L | Very large | Adult |
| Sf 4552 | U52 | 13'3'-14'3" | *Cercopithecoidea indet* | Metatarsaliv | Complete | L | Medium | Adult |
| Sf 4610 | U52 | 14'3"-15'3" | *Papionina* | Humerus | Distal shaft | R | Medium | Adult |
| Sf 4611 | U52 | 14'3"-15'3" | *Papionina* | Ulna | Prox | L | Medium | Adult |
| Sf 5495 | V45 | 18'6"-19'6" | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| Sf 5496 | V45 | 18'6"-19'6" | *Papio/Parapapio* | Femur | Head | L | Medium | Adult |
| St ? | Type site | | *Papio/Parapapio* | Humerus | Head | L | Medium | Adult |
| Sts ? | Type site | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| Sts ? | Type site | | *Cercopithecoidea indet* | Clavicle | | L | Medium | Adult |
| Sts ? | Type site | | *Cercopithecoidea indet* | Humerus | Distal and shaft | L | Medium | Adult |
| Sts 1069 | Type site | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| Sts 1089 | Type site | | *Cercopithecoidea indet* | Femur | Proximal missing trochnatae | L | Medium | Adult |
| Sts 1092 and 1733 | Type site | | *Cercopithecoidea indet* | Femur | Head and neck only | R | Medium | Adult |
| Sts 1094 | Type site | | *Cercopithecoidea indet* | Femur | Proximal femur | R | Small | Adult |
| Sts 1204 | Type site | | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| Sts 1264 | Type site | | *Papionina* | Humerus | Distal and shaft | L | Medium | Adult |
| Sts 1458 | Type site | | *Cercopithecoidea indet* | Humerus | Head | L | Medium | Adult |
| Sts 146 | Type site | | *Cercopithecoidea indet* | Pelvis | Ilium | R | Medium | Adult |
| Sts 1469 | Type site | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| Sts 1504 | Type site | | *Papio/Parapapio* | Humerus | Distal | L | Medium | Adult |
| Sts 1614 | Type site | | *Cercopithecoidea indet* | Femur | Distal and shaft | R | Medium | Adult |
| Sts 1663 | Type site | | *Cercopithecoidea indet* | Radius | Distal | ?R | Medium | Adult |
| Sts 1764 | Type site | | *Cercopithecoidea indet* | Radius | Distal | L | Small | Adult |
| Sts 1860 | Type site | | *Cercopithecoidea indet* | Tibia | Prox | R | Medium | Adult |
| Sts 1905 | Type site | | *Cercopithecoidea indet* | Femur | Distal | R | Medium | Adult |
| Sts 1978 | Type site | | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| Sts 1992 | Type site | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| Sts 2050 | Type site | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| Sts 2069 | Type site | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| Sts 2074 | Type site | | *Papionina* | Humerus | Distal and shaft | L | Small | Adult |
| Sts 2109 | Type site | | *Cercopithecoidea indet* | Femur | Proximal femur | R | Medium | Adult |
| Sts 2150 | Type site | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| Sts 2185 | Type site | | *Papionina* | Humerus | Proximalfragment | R | Medium | Adult |
| Sts 2188 | Type site | | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| Sts 2201 | Type site | | *Cercopithecoidea indet* | Humerus | Distal | R | Small | Adult |
| Sts 2219 | Type site | | *Parapapio* | Humerus | Proximal | R | Medium | Adult |
| Sts 2229 | Type site | | *Cercopithecoidea indet* | Pelvis | Acetabulum | L | Medium | Adult |
| Sts 2230 | Type site | | *Cercopithecoidea indet* | Tibia | Proximal | R | Medium | Adult |
| Sts 2259 | Type site | | *Cercopithecoidea indet* | Femur | Head | R | Medium | Adult |
| Sts 2357 | Type site | | *Cercopithecoidea indet* | Femur | Head | | Medium | Adult |
| Sts 2474 | Type site | | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| Sts 2521 | Type site | | *Cercopithecoidea indet* | Femur | Head and neck only | R | Medium | Adult |
| Sts 2562 | Type site | | *Cercopithecoidea indet* | Tibia | Proximal | L | Medium | Adult |
| Sts 2563 | Type site | | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| Sts 27? | Type site | | *Papionina* | Humerus | Distal shaft only | L | Medium | Adult |
| Sts 377c | Type site | | *Parapapio/papio* | Humerus | Distal | R | Medium | Adult |
| Sts 377d | Type site | | *Parapapio/papio* | ?Humerus | Shaft | | Medium | Adult |
| Sts 443 | Type site | | *Cercopithecoidea indet* | Femur | Proximal femur | R | Medium | Adult |
| Sts 549 | Type site | | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Adult |
| Sts unnumbered | Type site | | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 498 | D13 | ? | *Cercopithecoidea indet* | Tibia | Proximal | L | Medium | Adult |
| SWP 499 | D13 | | *Cercopithecoidea indet* | Pelvis | Acetabulum | L | Medium | Adult |
| SWP 500 | D13 | ? | *Cercopithecoidea indet* | Tbia | Distal | R | Medium | Adult |
| SWP 501 | D13 | ? | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 502 | D13 | ? | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 503 | D13 | ? | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 504 | D13 | | *Parapapio* | Humerus | Proximal | R | Medium | Adult |
| SWP 505 | D14 | | *Papio* | Humerus | Proximal | L | Medium | Adult |
| SWP 506 | D17 | ? | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 507 | D13 | | *Papio/Parapapio* | Humerus | Distal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 508 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 509 | D14 | | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 510 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 511 | D13 | ? | *Papio* | Humerus | Distal | L | Medium | Adult |
| SWP 512 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 513 | D13 | | *Cercopithecoidea indet* | Radius | Distal | L | Medium | Adult |
| SWP 514 | D13 | ? | *Papio* | Radius | Proximal | R | Medium | Adult |
| SWP 515 | D15 | ? | *Parapapio* | Radius | Proximal | L | Medium | Adult |
| SWP 516 | D13 | ? | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 517 | D13 | ? | *Papio* | Radius | Proximal | L | Medium | Adult |
| SWP 518 | D18 | ? | *Papio/Parapapio* | Radius | Proximal | L | Medium | Adult |
| SWP 519 | D18 | ? | *Papionina* | Radius | Proximal | R | Small | Adult |
| SWP 520 | D13 | | *Papionina* | Radius | Proximal | L | Medium | Adult |
| SWP 522 | D13 | ? | *Cercopithecoidea indet* | Radius | Head | ? | Large | Adult |
| SWP 523 | D13 | | *Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 524 | D13 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 525 | D13 | | *Cercopithecoidea indet* | Ulna | Proximal | | Medium | Adult |
| SWP 526 | D13 | | *Papio/Parapapio* | Femur | Proximal | L | Medium | Sub-adult |
| SWP 527 | D13 | | *Papionina* | Femur | Proximal | L | Medium | Adult |
| SWP 528 | D13 | | *Theropithecus* | Femur | Proximal | L | Medium | Adult |
| SWP 529 | D14 | | *Papionina* | Femur | Proximal | L | Medium | Adult |
| SWP 530 | D13 | | *Papionina* | Femur | Proximal | L | Medium | Adult |
| SWP 531 | D13 | ? | *Papio/Parapapio* | Femur | Proximal | R | Medium | Sub-adult |
| SWP 532 | D13 | | *Papio/Parapapio* | Femur | Proximal | R | Medium | Adult |
| SWP 533 | D13 | | *Papio/Parapapio* | Femur | Proximal | R | Medium | Adult |
| SWP 534 | D13 | ? | *Cercopithecoidea indet* | Fibula | Distal | ? | Medium | Adult |
| SWP 535 | D13 | | *Cercopithecoidea indet* | Fibula | Distal | L | Medium | Adult |
| SWP 536 | D13 | | *Cercopithecoidea indet* | Fibula | Distal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 537 | D18 | ? | *Cercopithecoidea indet* | Calcaneus | Complete | L | Large | Adult |
| SWP 538 | D13 | ? | *Cercopithecoidea indet* | Calcaneus | Complete | L | Large | Adult |
| SWP 539 | D13 | ? | *Cercopithecoidea indet* | Calcaneus | Complete | L | Medium | Juvenile |
| SWP 540 | D13 | | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 541 | D13 | | *Cercopithecoidea indet* | Talus | Frag | R | Medium | Adult |
| SWP 543 | D13 | | *Cercopithecoidea indet* | Talus | Complete | R | Medium | Adult |
| SWP 543 | D13 | | *Cercopithecoidea indet* | Talus | Complete | R | Medium | Sub-adult |
| SWP 544 | D13 | | *Cercopithecoidea indet* | Talus | Complete | R | Medium | Sub-adult |
| SWP 545 | ? | ? | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 560 | D18 | ? | *Cercopithecoidea indet* | Tibia | Proximal | R | Medium | Adult |
| SWP 561 | D15 | | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 562 | D14 | | *Papio/Parapapio* | Humerus | Distal | L | Medium | Adult |
| SWP 563 | D18 | ? | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 568 | D13 | ? | *Cercopithecoidea indet* | Calcaneus | Posterior | L | Medium | Adult |
| SWP 570 | D13 | ? | *Cercopithecoidea indet* | Radius | Fragment | ? | Medium | Adult |
| SWP 577 | D18 | | *Cercopithecoidea indet* | Vmetatarsal | Complete | R | Medium | Adult |
| SWP 578 | D18 | ? | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 589 | D18 | ? | *Cercopithecoidea indet* | Humerus | condyle | L | Medium | Adult |
| SWP 604 | D14 | | *Cercopithecoidea indet* | Femur | Distal condyles | R | Medium | Adult |
| SWP 606 | D15 | ? | *Cercopithecoidea indet* | Humerus | Proximal | L | Medium | Adult |
| SWP 608 | D13 | | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 693 | D13 | | *Cercopithecoidea indet* | Pelvis | Acetabulum | R | Medium | Adult |
| SWP 694 | D13 | | *Cercopithecoidea indet* | Pelvis | Os coxa | R | Medium | Adult |
| SWP 695 | D13 | | *Cercopithecoidea indet* | Pelvis | Ischium | R | Medium | Adult |
| SWP 696 | D13 | | *Cercopithecoidea indet* | Pelvis | Ischium | R | Medium | Adult |
| SWP 697 | D13 | | *Cercopithecoidea indet* | Pelvis | Ischium | ? | Medium | Adult |
| SWP 698 | D13 | | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| SWP 699 | D13 | | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 700 | D13 | | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| SWP 701 | D13 | | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| SWP 703 | D13 | | *Cercopithecoidea indet* | Pelvis | Acetabulum | L | Medium | Adult |
| SWP 705 | D13 | | *Cercopithecoidea indet* | Pelvis | Ischium | ? | Medium | Adult |
| SWP 706 | D13 | | *Cercopithecoidea indet* | Pelvis | Ischium | ? | Medium | Adult |
| SWP 707 | D13 | | *Cercopithecoidea indet* | Pelvis | Ischium | ? | Medium | Adult |
| SWP 708 | D13 | | *Cercopithecoidea indet* | Pelvis | Acetabulum fr | ? | Medium | Adult |
| SWP 709 | D13 | | *Cercopithecoidea indet* | Pelvis | Acetabulum | ? | Medium | Adult |
| SWP 709 | D13 | | *Cercopithecoidea indet* | Pelvis | Acetabulum | L | Medium | Adult |
| SWP 719 | D13 | | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 719 | D14 | | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 721 | D13 | | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 722 | D13 | | *Cercopithecoidea indet* | Tibia and fibula articulated | Distal and shaft | R | Medium | Adult |
| SWP 723 | D13 | | *Cercopithecoidea indet* | Tibia | Distal | ? | Medium | Adult |
| SWP 724 | D13 | ? | *Cercopithecoidea indet* | Tibia | Proximal | R | Medium | Adult |
| SWP 725 | D13 | | *Cercopithecoidea indet* | Humerus | Distal shaft | R | Medium | Adult |
| SWP 726 | D13 | | *Papionin* | Humerus | Distal and shaft | R | Medium | Adult |
| SWP 727 | D13 | | *Papionin* | Humerus | Distal and shaft | L | Medium | Adult |
| SWP 728 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 729 | D13 | | *Papionin* | Humerus | Distal and shaft | L | Medium | Adult |
| SWP 731 | D13 | | *Cercopithecoidea indet* | Humerus | Proximal | R | Medium | Adult |
| SWP 732 | D13 | | *Cercopithecoidea indet* | Femur | Distal | L | Medium | Adult |
| SWP 733 | D13 | | *Cercopithecoidea indet* | Femur | Distal | R | Medium | Adult |
| SWP 734 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 735 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 736 | D13 | | *Cercopithecoidea indet* | Femur | Proximal fr | L | Medium | Adult |
| SWP 737 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 738 | D13 | | *?Papionina* | Femur | Proximal | L | Medium | Adult |
| SWP 739 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | R | Medium | Adult |
| SWP 740 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 741 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 742 | D13 | | *Papionina* | Femur | Proximal | R | Medium | Adult |
| SWP 743 | D13 | | *Papionina* | Femur | Proximal | L | Medium | Adult |
| SWP 744 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | ? | Medium | Adult |
| SWP 745 | D13 | | *Papionina* | Femur | Proximal | R | Medium | Adult |
| SWP 746 | D13 | | *Papio/Parapapio* | Femur | Proximal | R | Medium | Adult |
| SWP 747 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 748 | D12 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 749 | D13 | | *Cercopithecoidea indet* | Femur | Head fragment | L | Large | Adult |
| SWP 750 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 751 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 752 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 753 | D13 | | *Papionina* | Femur | Proximal | R | Medium | Adult |
| SWP 754 | D13 | | *Papionina* | Femur | Proximal | R | Medium | Adult |
| SWP 755 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | ?R | Medium | Adult |
| SWP 756 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 757 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | ? L | Medium | Adult |
| SWP 758 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 759 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 760 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 761 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 762 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 763 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 764 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 765 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 767 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 768 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 769 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 770 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 771 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 772 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 773 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 774 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 775 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 776 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 777 | D13 | ? | *Cercopithecoidea indet* | Radius | Distal | ? | Small | Adult |
| SWP 778 | D13 | ? | *Cercopithecoidea indet* | Radius | Distal | ? | Small | Adult |
| SWP 779 | D13 | ? | *Cercopithecoidea indet* | Radius | Distal | ? | Small | Adult |
| SWP 780 | D13 | ? | *Cercopithecoidea indet* | Radius | Proximal | ? | Medium | Adult |
| SWP 781 | D18 | ? | *Cercopithecoidea indet* | Radius | Proximal | L | Medium | Adult |
| SWP 782 | D12 | | *Cercopithecoidea indet* | Radius | Proximal | R | Small | Juvenile |
| SWP 783 | D12 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 784 | D12 | | *Parapapio* | Radius | Proximal | R | Medium | Adult |
| SWP 785 | D13 | | *Cercopithecoidea indet* | Radius | Proximal | ? | Medium | Adult |
| SWP 786 | D13 | | *Cercopithecoidea indet* | Radius | Proximal | ? | Medium | Adult |
| SWP 787 | D13 | ? | *Cercopithecoidea indet* | Radius | Proximal | ? | Small | Adult |
| SWP 788 | D13 | | *Papionini* | Radius | Head | ? | Medium | Adult |
| SWP 789 | D13 | ? | *Cercopithecoidea indet* | Radius | Fragment | ? | Large | Adult |
| SWP 790 | D13 | ? | *Cercopithecoidea indet* | Radius | Proximal | R | Medium | Adult |
| SWP 791 | D13 | ? | *Papio* | Radius | Proximal | L | Small | Adult |
| SWP 792 | D?3 | ? | *Papionina* | Radius | Proximal | L | Medium | Adult |
| SWP 793 | ? | ? | *Papio sp* | Radius | Proximal | R | Medium | Adult |
| SWP 794 | D13 | | *Cercopithecoidea indet* | Radius | Head | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 795 | D13 | ? | *Cercopithecoidea indet* | Radius | Head and neck | ? | Medium | Adult |
| SWP 796 | D13 | | *Cercopithecoidea indet* | Ulna | Proximal | ? | Medium | Adult |
| SWP 797 | D13 | ? | *Papionina* | Radius | Head | ? | Medium | Adult |
| SWP 798 | D12 | ? | *Parapapio* | Radius | Proximal | R | Small | Adult |
| SWP 799 | D13 | | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 800 | D13 | ? | *Cercopithecoidea indet* | Radius | Head | ? | Medium | Adult |
| SWP 801 | D13 | ? | *Cercopithecus sp* | Radius | Proximal | L | Medium | Adult |
| SWP 802 | D13 | ? | *Parapapio* | Radius | Proximal | R | Medium | Adult |
| SWP 803 | D13 | ? | *Papio* | Radius | Proximal | R | Medium | Adult |
| SWP 804 / 904 | D13 | | *Cercopithecoidea indet* | Radius | Proximal | ? | Medium | Adult |
| SWP 805 | D13 | | *Cercopithecoidea indet* | Radius | Proximal | ? | Medium | Adult |
| SWP 806 | D13 | ? | *Papionina* | Radius | Proximal | L | Medium | Adult |
| SWP 808 | D13 | ? | *Papionina* | Radius | Proximal | L | Medium | Adult |
| SWP 809 | D13 | | *Cercopithecoidea indet* | Radius | Distal | L | Medium | Adult |
| SWP 810 | D13 | | *Cercopithecoidea indet* | Radius | Distal | R | Medium | Adult |
| SWP 811 | D13 | | *Cercopithecoidea indet* | Tibia | Distal | ? | Medium | Adult |
| SWP 812 | D13 | | *Cercopithecoidea indet* | Ulna | Distal | ? | Medium | Adult |
| SWP 813 | D13 | | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 814 | D13 | | *Papio* | Ulna | Proximal | R | Medium | Adult |
| SWP 815 | D13 | | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 816 | D13 | | *Papionina* | Ulna | Proximal | R | Large | Adult |
| SWP 817 | D13 | | *Theropithecus* | Ulna | Proximal | L | Large | Adult |
| SWP 819 | D13 | | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| SWP 820 | D13 | | *Cercopithecoidea indet* | Ulna | Proximal | L | Medium | Adult |
| SWP 821 | D13 | | *Cercopithecoidea indet* | Ulna | Prox | R | Medium | Adult |
| SWP 822 | D13 | | *Theropithecus* | Ulna | Prox | L | Medium | Sub-adult |
| SWP 824 | D13 | | *Papio* | Ulna | Proximal | R | Medium | Adult |
| SWP 825 | D13 | | *Theropithecus* | Ulna | Proximal | R | Large | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 826 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 827 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 828 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 829 | D13 | | *Cercopithecoidea indet* | Ulna, radius | Shaft | ? | Medium | Adult |
| SWP 830 | D13 | | *Papio* | Ulna, radius, humerus | Proximal with shaft | R | Medium | Adult |
| SWP 831 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 832 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 833 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 834 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 835 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 836 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 837 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 838 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 839 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 840 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 841 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 842 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 843 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 845 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 846 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 847 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 848 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 849 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 850 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 851 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 852 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 853 | D13 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 853 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 854 | D13 | | *Cercopithecoidea indet* | Long bone | Shaft | | Medium | Adult |
| SWP 855 | D13 | | *Cercopithecoidea indet* | Long bone | Shaft | | Medium | Adult |
| SWP 856 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 857 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 858 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 859 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 860 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 861 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 862 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 863 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 864 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 865 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 866 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 867 | D13 | | *Cercopithecoidea indet* | Femur | Distal condyle | ?L | Medium | Adult |
| SWP 868 | D13 | | *Cercopithecoidea indet* | Femur | Distal condyle | ? | Medium | Adult |
| SWP 869 | ? | ? | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 870 | D13 | | *Cercopithecoidea indet* | Femur | Head | ?L | Medium | Adult |
| SWP 871 | D13 | | *Cercopithecoidea indet* | Femur | Head | ?L | Medium | Adult |
| SWP 872 | D13 | | *Cercopithecoidea indet* | Femur | Head | R | Medium | Adult |
| SWP 873 | D13 | | *Cercopithecoidea indet* | Femur | Head | L | Medium | Adult |
| SWP 874 | M4 | | *Cercopithecoidea indet* | Femur | Head | | Medium | Juvenile |
| SWP 875 | D13 | | *Cercopithecoidea indet* | Femur | Head | ? | | Juvenile |
| SWP 876 | | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Sub-adult |
| SWP 877 | | ? | *Cercopithecoidea indet* | Femur | Head | R | Small | Sub-adult |
| SWP 878 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 879 | M4 | | *Cercopithecoidea indet* | Femur | Head | ? | Large | Juvenile |
| SWP 880 | D13 | | *Cercopithecoidea indet* | Femur | Head | L | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 881 | D13 | | *Cercopithecoidea indet* | Femur | Proximalshaft | ? | Medium | Adult |
| SWP 882 | D13 | | *Cercopithecoidea indet* | Femur | Prox | ? | Medium | Adult |
| SWP 883 | D13 | | *Cercopithecoides sp* | Femur | Proximal | L | Medium | Adult |
| SWP 884 | D13 | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 885 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 886 | M4 | ? | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Juvenile |
| SWP 887 | D13 | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Juvenile |
| SWP 888 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | ?L | Medium | Adult |
| SWP 889 | D13 | | *Cercopithecoidea indet* | Femur | Proximal fr | ? | Medium | Adult |
| SWP 890 | D13 | | *Cercopithecoidea indet* | Femur | Head | ? | Med | Juvenile |
| SWP 891 | M4 | ? | *Cercopithecoidea indet* | Femur | Head | L | Large | Adult |
| SWP 892 | M4 | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 893 | D13 | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 894 | D13 | | *Cercopithecoidea indet* | Femu | Head | ? | Medium | Adult |
| SWP 895 | M4 | | *Cercopithecoidea indet* | Femur | Head | ? | Med | Juvenile |
| SWP 896 | D13 | | *Cercopithecoidea indet* | Femur | Head | L | Med | Sub-adult |
| SWP 897 | D13 | | *Cercopithecoidea indet* | Femur | Head | ?R | Medium | Adult |
| SWP 898 | D13 | | *Cercopithecoidea indet* | Femur | Head fr | ? | Medium | Adult |
| SWP 899 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 900 | D13 | | *Papionina* | Femur | Proximal | R | Medium | Adult |
| SWP 901 | D13 | | *Cercopithecoidea indet* | Femur | Prox | ? | Medium | Adult |
| SWP 902 | D13 | | *Cercopithecoidea indet* | Femur | Proximal fr | ? | Medium | Adult |
| SWP 903 | D13 | | *Cercopithecoidea indet* | Femur | Proximal fr | ? | Medium | Adult |
| SWP 904 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | ? | Medium | Adult |
| SWP 905 | D17 | | *Papionina* | Femur | Proximal | R | Medium | Adult |
| SWP 906 | D13 | | *Cercopithecoidea indet* | Humerus | Distal shaft | ? | Medium | Adult |
| SWP 907 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | ? | Medium | Adult |
| SWP 908 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| \SWP 909 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | | Medium | Adult |
| SWP 910 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 911 | D13 | | *Papio* | Humerus | Distal | R | Medium | Adult |
| SWP 912 | D13 | | *Papio/Parapapio* | Humerus | Distal condyle | R | Medium | Sub-adult |
| SWP 913 | D13 | | *Cercopithecoidea indet* | Humerus | Distal condyle | R | Medium | Sub-adult |
| SWP 914 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 915 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | ? | Medium | Adult |
| SWP 916 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 917 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | ? | Medium | Adult |
| SWP 918 | D13 | | *Cercopithecoidea indet* | Humerus | Distal shaft | ? | Medium | Adult |
| SWP 919 | D13 | | *Cercopithecoidea indet* | Humerus | Distal shaft | ? | Medium | Adult |
| SWP 922 | D13 | | *Cercopithecoidea indet* | Humerus | Distal shaft | L | Medium | Adult |
| SWP 923 | D13 | | *Cercopithecoidea indet* | Humerus | Distal condyle | | Medium | Adult |
| SWP 924 | D13 | | *Cercopithecoidea indet* | Humerus | Distal condyle | L | Medium | Adult |
| SWP 925 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | ? | Medium | Adult |
| SWP 926 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 927 | D13 | | *Cercopithecoidea indet* | Humerus | Distal | ? | Medium | Adult |
| SWP 928 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 929 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 930 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 931 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| SWP 932 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 933 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 934 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| SWP 935 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 936 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 937 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 938 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 939 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 940 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 941 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 942 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 943 | D13 | | *Cercopithecoidea indet* | Long bone | Shaft | | Medium | Adult |
| SWP 944 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 945 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | | Medium | Adult |
| SWP 946 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 947 | D13 | | *Cercopithecoidea indet* | Radius | Shaft | | Large | Adult |
| SWP 948 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 949 | D13 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 950 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 952 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Small | Adult |
| SWP 953 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 954 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 955 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 956 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| SWP 957 | D13 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 958 | D13 | | *Cercopithecoidea indet* | Humerus | Head | ? | Medium | Adult |
| SWP 959 | D13 | | *Parapapio* | Humerus | Head | R | Medium | Adult |
| SWP 960 | D13 | ? | *Papio sp* | Humerus | Proximal | L | Medium | Adult |
| SWP 961 | D13 | | *Cercopithecoidea indet* | Humerus | Proximal | ? | Medium | Sub-adult |
| SWP 962 | D13 | | *Parapapio* | Humerus | Proximal | R | Medium | Adult |
| SWP 963 | D13 | | *Papionina* | Humerus | Proximal | L | Medium | Sub-adult |
| SWP 964 | M4 | | *Cercopithecoidea indet* | Humerus | Proximal | L | Medium | Adult |
| SWP 965 | D18 | | *Papionina* | Humerus | Proximal | L | Medium | Adult |
| SWP 966 | D13 | | *Cercopithecoidea indet* | Humerus | Proximal | R | Medium | Adult |
| SWP 967 | D13 | | *Papio sp* | Humerus | Proximal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 968 | D15 | ? | *Cercopithecoidea indet* | Fibula | Proximal | L | Medium | Adult |
| SWP 971 | D14 | ? | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 972 | D14 | ? | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 973 | D14 | ? | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 974 | D13 | | *Cercopithecoidea indet* | Thoracic Vertebra | Body | | Small | Adult |
| SWP 975 | D13 | | *Cercopithecoidea indet* | Vertebra | Axis | | Small | Adult |
| SWP 976 | D13 | | *Cercopithecoidea indet* | Cervical Vertebra | Complete | | Small | Adult |
| SWP 977 | D13 | | *Cercopithecoidea indet* | Cervical Vertebra | Complete | | Small | Adult |
| SWP 978 | D13 | | *Cercopithecoidea indet* | Vertebra | Body | | Medium | Adult |
| SWP 980 | D10 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 981 | D10 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 982 | D10 | | *Cercopithecoidea indet* | Humerus | Proximal | R | Medium | Adult |
| SWP 983 | D10 | | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| SWP 984 | D15 | | *Cercopithecoidea indet* | Tibia | Shaft | L | Medium | Adult |
| SWP 985 | D15 | | *Cercopithecoidea indet* | Tibia | Shaft | | Medium | Adult |
| SWP 986 | D15 | | *Cercopithecoidea indet* | Bone Fragment | Fragment | | Medium | Adult |
| SWP 987 | D15 | | *Cercopithecoidea indet* | Humerus | Distal fragment | L | Medium | Adult |
| SWP 989 | D15 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 990 | D15 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 991 | D15 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 992 | D15 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 993 | D14 | | *Papionina* | Humerus | Proximal | R | Medium | Adult |
| SWP 994 | D14 | | *Cercopithecoidea indet* | Humerus | Shaft | | Medium | Adult |
| SWP 995 | D14 | | *Papio/Parapapio* | Humerus | Distal | L | Medium | Adult |
| SWP 996 | | | *Cercopithecoidea indet* | Tibia | Shaft | | Medium | Adult |
| SWP 997 | D14 | | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 998 | D14 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 999 | D14 | | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP?979 | D10 | ? | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 1?79 | ? | | *Papionina* | Ulna | Proximal | L | Medium | Adult |
| SWP 1000 | D14 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 1001 | D14 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 1002 | D14 | | *Cercopithecoidea indet* | Femur | Proximal fr | ? | Medium | Adult |
| SWP 1003 | D14 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 1004 | D14 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 1005 | D14 | | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 1006 | D14 | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 1007 | D14 | | *Cercopithecoidea indet* | Femur | Head fr | ? | Medium | Adult |
| SWP 1008 | D14 | | *Papio/Parapapio* | Femur | Proximal | R | Medium | Adult |
| SWP 1009 | D14 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1010 | D14 | | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| SWP 1011 | D14 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1015 | D13 | ? | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 1016 | D13 | | *Papio/Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 1103 | D13 | | *Cercopithecoidea indet* | Ulna | Shaft | | | |
| SWP 1104 | T46 | 9' 10"- 10' 10" | *Theropithecus* | Ulna | Proximal | L | Large | Adult |
| SWP 1105 | S/48 | 13'6"-14'5" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Large | Adult |
| SWP 1107 | Dd48 | 10' 6"- 11' 8" | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 1108/9? | U44 | 10'10"-11'10" | *Cercopithecoidea indet* | Humerus | Distal | ? | Medium | Adult |
| SWP 1110 | Aa 48 | 4'1"-5'1" | *Theropithecus* | Ulna | Proximal | L | Large | Adult |
| SWP 1113 | M61 | 12' 8" - 13' 8" | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 1114 | D17 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1115 | M4 | | *Cercopithecoidea indet* | Humerus | Head fr | ? | Medium | Adult |
| SWP 1116 | D17 | | *Cercopithecoidea indet* | Femur | Proximalfr | ? | Medium | |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 1117 | D17 | | *Cercopithecoidea indet* | Femur | Proximalfr | ? | Medium | |
| SWP 1118 | D17 | | *Cercopithecoidea indet* | Femur | Proximalfr | ? | Medium | Adult |
| SWP 1125 | O45 | 13' 3" - 13' 11" | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 1126 | Aa 44 | 6' 7" - 7' 10" | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1127 | Aa 44 | 6' 7" - 7' 10" | *Cercopithecoidea indet* | Femur | Proximal shaft | R | Small | Adult |
| SWP 1128 | V49 | 13' 10" - 14' 10" | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 1132 | D13 | | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1137 | U57 | 10'5"-11'5" | *Parapapio* | Humerus | Distal | ? | Medium | Adult |
| SWP 1138 | T57 | 11' 1" - 12' 1" | *Cercopithecoidea indet* | Talus | Complete | L | Medium | Adult |
| SWP 1139 | T45 | 6'0"-7'0" | *Cercopithecoidea indet* | Radius | Shaft | R | Small | Juvenile |
| SWP 1140 | W46 | 3'11"-4'11" | *Papio/Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 1141 | W46 | 3'11"-4'11" | *Papio/Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 1142 | U48 | 7' 6" - 8' 6" | *Cercopithecoidea indet* | Clavicle | Complete | L | | |
| SWP 1143 | U48 | 7' 6" - 8' 6" | *Cercopithecoidea indet* | Metatarsal | Third | L | Medium | Adult |
| SWP 1144 | U48 | 7' 6" - 8' 6" | *Parapapio* | Ivmetatarsal | Complete | R | Medium | Adult |
| SWP 1145 | U48 | 7' 6" - 8' 6" | *Cercopithecoidea indet* | Metapodial | Distal | ? | Medium | Adult |
| SWP 1146 | U49 | 7'6"-8'6" | *Cercopithecoidea indet* | Calcaneus | Complete | L | Medium | Adult |
| SWP 1147 | U49 | 7'6"-8'6" | *Cercopithecoidea indet* | Patella | Complete | L | Medium | Adult |
| SWP 1148 | Q46 | 8' 8"- 9' 8" | *Theropithecus* | Ulna | Proximal | R | Large | Adult |
| SWP 1149 | P49 | 10' 6" - 11' 6" | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 1150 | P46 | 10' 2" 11' 2" | *Cercopithecoidea indet* | Femur | Proximal fragment | R | Medium | Adult |
| SWP 1151 | P46 | 10'2"-11'2" | *Cercopithecoidea indet* | Metapodial | Distal | ? | Medium | Adult |
| SWP 1152 | P45 | 13' 4" - 14' 4" | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1155 | R46 | 6'2"-7'2" | *Papio* | Ulna | Olecranon | L | Medium | Adult |
| SWP 1156 | T49 | 8'8" - 9' 8" | *Theropithecus* | Ulna | Proximal fragment | L | Medium | Adult |
| SWP 1157 | V47 | 8' 4" - 9' 4" | *Cercopithecoidea indet* | Calcaneus | Complete | L | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 1158 | S48 | 9'8"-10'8" | *Cercopithecoidea indet* | Phalanx | Proximal manus | ? | Medium | Adult |
| SWP 1159 | S48 | 9'8"-10'8" | *Cercopithecoidea indet* | Metatarsal | Complete | ? | Medium | Adult |
| SWP 1160 | S49 | 9'8"-10'8" | *Cercopithecoidea indet* | Phalanx | Proximal manus | ? | Medium | Adult |
| SWP 1161 | T47 | 9' 4" - 10' 4" | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 1162 | V53 | 10'9"-11'9" | *Papionina* | Radius | Proximal | ? | Large | Adult |
| SWP 1164 | X54 | 9' 3" - 10' 3" | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 1165 | U52 | 12' 3" - 13' 3" | *Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 1166 | P47 | 6' 2"-7' 2" | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| SWP 1171 | V47 | 5' 10" - 6' 10" | *Papio/Parapapio* | Femur | Proximal | L | Medium | Adult |
| SWP 1172 | S46 | 5' 8" - 6' 8" | *Cercopithecoidea indet* | Pelvis | Os coxa fr | L | Medium | Adult |
| SWP 1173 | T49 | 6'8"-7'8" | *Cercopithecoidea indet* | Humerus | Proximal | ? | Medium | Juvenile |
| SWP 1174 | V48 | 6' 10" - 7' 10" | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 1175 | U48 | 6'6"-7'6" | *Cercopithecoidea indet* | Femur | Distal | R | Medium | Sub-adult |
| SWP 1176 | U48 | 6'6"-7'6" | *Papio* | Humerus | Distal | L | Medium | Adult |
| SWP 1197 | T63 | 3'5"-4'5" | *Papionina* | Ulna | Proximal | L | Medium | Adult |
| SWP 1198 | V57 | 10' 3" - 11' 0" | *Papionina* | Radius | Proximal | L | Medium | Adult |
| SWP 1199 | V57 | 10' 3" - 11' 0" | *Papio/Parapapio* | Humerus | Proximal | R | Medium | Adult |
| SWP 1200 | W57 | 9' 2" - 10' 2" | *Papio* | Ulna | Proximal | L | Medium | Adult |
| SWP 1201 | W57 | 9' 2" - 10' 2" | *Papio* | Humerus | Proximal | L | Medium | Adult |
| SWP 1205 | U57 | 5'2"-6'2" | *Papio/Parapapio* | Humerus | Shaft | ? | Medium | Adult |
| SWP 12059 | P44 | 22'7'-23'7' | *Cercopithecoidea indet* | Scapula | Glenoid cavity | R | Small | Adult |
| SWP 1206 | Jj35 | 8'6"-9'5" | *Papio/Parapapio* | Femur | Head | L | Medium | Sub-adult |
| SWP 1207 | W56 | 9' 10" - 10' 10" | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 1208 | V63 | 8' 6" - 9' 6" | *Papio* | Ulna | Proximal | L | Medium | Adult |
| SWP 1209 | T61 | 23'1"-24'1" | *Cercopithecoidea indet* | Radius | Fr | | | |
| SWP 1210 | T62 | 23'1"-24'1" | *Cercopithecoidea indet* | Pes proximalphal | Complete | ? | Medium | Adult |
| SWP 1211 | R65 | 14'8"-15'8" | *Parapapio* | Humerus | Distal | | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 1212 | O59 | 13' 6" - 14' 6" | *Cercopithecoidea indet* | Tibia | Shaft | ? | Large | Adult |
| SWP 1213 | R65 | 10' 8" - 11' 8" | *Papionina* | Ulna | Proximal | R | Medium | Sub-adult |
| SWP 1214 | U50 | 10' 8" - 11' 8" | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 1215 | T62 | 16' 1" - 17' 1" | *Cercopithecoidea indet* | Radius | Proximal | L | Medium | Adult |
| SWP 1219 | V47 | 7' 10" - 8' 10" | *Parapapio* | Radius | Proximal | L | Medium | Adult |
| SWP 1222 | V47 | 7' 10" - 8' 10" | *Cercopithecoidea indet* | Manus | Proximal | ? | Medium | Adult |
| SWP 1223 | V47 | 7'10"-8'10" | *Cercopithecoidea indet* | Manus | Proximal | ? | Medium | Adult |
| SWP 1225 | V47 | 7' 10" - 8' 10" | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 1262 | T59 | 9'5"-10'5" | *Parapapio* | Humerus | Distal | L | Medium | Adult |
| SWP 1263 | Hh 38 | 8'10"-9'10" | *Papio/Parapapio* | Femur | Proximal and shaft | L | Medium | Sub-adult |
| SWP 1266 | Ii 36 | 14'4"-15'4" | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Juvenile |
| SWP 1267 | V63 | 6' 9"- 7' 9" | *Cercopithecoidea indet* | Metapodial | | ? | Large | Adult |
| SWP 1268 | W47 | 6'6"-7'6" | *Cercopithecoidea indet* | Humerus | Condyle | L | Medium | Sub-adult |
| SWP 1269 | R49 | 10' 2" - 11' 2" | *Cercopithecoidea indet* | Phalanx | Indet. | ? | Medium | Adult |
| SWP 1270 | V63 | 4' 9" - 5' 9" | *Cercopithecoidea indet* | Metapodial | Proximal and shaft | R | Medium | Adult |
| SWP 1271 | W57 | 7' 5" - 8' 5" | *Papio/Parapapio* | Humerus | Distal | R | Medium | Sub-adult |
| SWP 1273 | T46 | 8' 6" - 9' 6" | *Cercopithecoidea indet* | Calcaneus | Complete | L | Medium | Adult |
| SWP 1274 | T48 | 8' 6" - 9' 6" | *Cercopithecoidea indet* | Femur | Distal | L | Medium | Adult |
| SWP 1275 | V44 | 10'10"-11'10" | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 1276 | T60 | | *Papio* | Humerus | Prox | ? | Medium | Adult |
| SWP 1277 | T67 | 14' 7" - 15' 9" | *Cercopithecoidea indet* | Tibia | Shaft | L | Large | Adult |
| SWP 1286 | U61 | 14' 2" - 15' 1" | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 1287 | W58 | 14'11"-15'11" | *Parapapio* | Humerus | Distal | | Medium | Adult |
| SWP 1291 | V62 | 7' 5" - 8' 5" | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 1300 | V62 | 16'8"-17'8" | *Parapapio* | Femur | Proximal and shaft | L | Medium | Adult |
| SWP 1301 | V62 | 8' 5" - 9' 5" | *Cercopithecoidea indet* | Femur | Distal condyle | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 1305 | T60 | 18' 2" - 19' 2" | *Cercopithecoidea indet* | Patella | Complete | ?L | Small | Adult |
| SWP 1339 | Cc49 | 7' 7" - 8' 6" | *Cercopithecoidea indet* | Metartasal | 2nd | R | Medium | Adult |
| SWP 1340 | Dd47 | 4'8"-5'8" | *Cercopithecoidea indet* | Metatarsal | Fr | ? | Medium | Adult |
| SWP 1341 | Ee46 | 5' 7" - 6' 7" | *Cercopithecoidea indet* | Phalanx | Complete | | Medium | Adult |
| SWP 1342 | Ee46 | 5' 7" - 6' 7" | *Cercopithecoidea indet* | Vertebraebra | Cervical | | Medium | Adult |
| SWP 1343 | Ee46 | 5' 7" - 6' 7" | *Cercopithecoidea indet* | Clavicle | Complete | L | Medium | Juvenile |
| SWP 1344 | Cc42 | 4' 6" - 5' 6" | *Cercopithecoidea indet* | Vertebraebra | Atlas | | Medium | Adult |
| SWP 1350 | Cc43 | 3' 7" - 4' 7" | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Juvenile |
| SWP 1351 | Ee44 | 3’ 5” – 4’ 5” | *Cercopithecoidea indet* | Femur | Proximal | R | Small | Juvenile |
| SWP 1352 | Bb54 | 7' 2" - 8' 2" | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 1353 | Dd49 | 12’6’-13’-6” | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 1355 | Aa50 | 6' 9" - 7' 9" | *Papionina* | Femur | Shaft | R | Medium | Adult |
| SWP 1356 | Cc 50 | 9' 4"- 10' 4" | *Cercopithecoidea indet* | Tibia | Proximal fragment | ? | Medium | Adult |
| SWP 1357 | Aa 50 | 5' 9" - 6' 9" | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 1374 | Ee50 | 8' 10" - 9' 10" | *Cercopithecoidea indet* | Scapula | Fr | L | Medium | Adult |
| SWP 1375 | Ee50 | 8' 10" - 9' 10" | *Cercopithecoidea indet* | Metatarsal | Complete | R | Medium | Adult |
| SWP 1376 | Ee 50 | 8' 10" - 9' 10" | *Cercopithecoidea indet* | Humerus | Proximal | R | Medium | Adult |
| SWP 1421 | | | *Cercopithecinae* | Radius | Head | ? | Medium | Adult |
| SWP 1507 | D17 | ? | *Cercopithecoidea indet* | Radius | Shaft | | Medium | Adult |
| SWP 1508 | D13 | | *Cercopithecoidea indet* | Humerus | Condyles | | Medium | Adult |
| SWP 1509 | D13 | | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Adult |
| SWP 1510 | D18 | ? | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 1511 | D18 | ? | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 1512 | D18 | ? | *Cercopithecoidea indet* | Calcaneus | Proximal head | L | Medium | Adult |
| SWP 1513 | D18 | | *Papionina* | Ulna | Proximal | L | Medium | Adult |
| SWP 1514 | D18 | | *Papionina* | Femur | Proximal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 1515 | D18 | ? | *Cercopithecoidea indet* | Radius | Proximal | R | Medium | Adult |
| SWP 1516 | D18 | ? | *Cercopithecoidea indet* | Metapodial | Distal | ? | Medium | Adult |
| SWP 1517 | D18 | ? | *Cercopithecoidea indet* | Phalanx | Complete | ? | Medium | Adult |
| SWP 1518 | D18 | | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 1519 | D18 | | *Papio/Parapapio* | Radius | Proximal | | Medium | Adult |
| SWP 1520 | D13 | ? | *Cercopithecoidea indet* | Radius | Proximal | L | Medium | Adult |
| SWP 1520 | D18 | | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 1521 | D18 | | *Cercopithecoidea indet* | Radius | Proximal | ? | Medium | Adult |
| SWP 1522 | D18 | ? | *Cercopithecoidea indet* | Radius | Proximal | L | Small | Adult |
| SWP 1523 | D18 | | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Adult |
| SWP 1524 | D18 | | *Cercopithecoidea indet* | Humerus | Distal | | Medium | Adult |
| SWP 1525 | D18 | | *Cercopithecoidea indet* | Humerus | Capitulum | L | Medium | Adult |
| SWP 1525 | D18 | | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 1526 | D18 | | *Cercopithecoidea indet* | Humerus | Distal condyles | L | Medium | Adult |
| SWP 1528 | D18 | | *Cercopithecoidea indet* | Fibula | Distal | R | Medium | Adult |
| SWP 1529 | D18 | | *Cercopithecoidea indet* | Humerus | Distal condyles | R | Medium | Adult |
| SWP 1530 | D18 | | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 1531 | D18 | ? | *Cercopithecoidea indet* | Ulna | Proximal | L | Medium | Adult |
| SWP 1540 | D14 | ? | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 1553 | R41 | 8' 10" - 9' 10" | *Cercopithecoidea indet* | Radius | Prox | L | Medium | Adult |
| SWP 1563 | D18 | | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 1564 | ? | | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 1565 | D18 | | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 1567 | D18 | | *Papionina* | Ulna | Proximal | L | Medium | Adult |
| SWP 1568 | D18 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 1569 | D18 | | *Papio/Parapapio* | Ulna | Proximal | L | Medium | Adult |
| SWP 1570 | D18 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 1571 | D18 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 1572 | D18 | | *Papio* | Ulna | Proximal | | | |
| SWP 1573 | D18 | ? | *Papionina* | Ulna | Proximal | R | Large | Adult |
| SWP 1574 | D18 | | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 1575 | ? | | *Papionina* | Ulna | Proximal | L | Medium | Adult |
| SWP 1576 | D18 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 1577 | D18 | | *Papio* | Ulna | Proximal | L | Medium | Adult |
| SWP 1578 | D18 | | *Theropithecus* | Ulna | Proximal | R | Medium | Adult |
| SWP 1580 | D18 | | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 1596 | ? | ? | *Cercopithecoidea indet* | Tibia | Proxima | R | Medium | Adult |
| SWP 1608 | D15 | | *Cercopithecoidea indet* | Tibia | Distal and shaft | R | Medium | Adult |
| SWP 1629 | ? | | *Cercopithecoidea indet* | Metatarsal | Proximal | ? | Medium | Adult |
| SWP 1723 | D13 | ? | *Cercopithecoidea indet* | Tibia | Proximal and shaft | ? | Medium | Adult |
| SWP 2308 | T33 | | *Cercopithecoidea indet* | Fibula | Distal | R | Medium | Adult |
| SWP 2357a,b (2 pieces) | | | *Cercopithecoidea indet* | 2 ulna | Shaft fragment | ? | Medium | Adult |
| SWP 2537 | | | *Papio/Parapapio* | Humerus | Distal | | Medium | Adult |
| SWP 255 | V47 | ? | *Papionina* | Radius | Head | ? | Medium | Adult |
| SWP 2713 | S48 | 25'7"-26'7" | *Cercopithecoidea indet* | Ulna | Olecranon process | R | Medium | Adult |
| SWP 2746 | T39 | 7'7'-8'7' | *Cercopithecoidea indet* | Ulna | | R | Medium | Adult |
| SWP 2747 | T39 | 7'7'-8'7' | *Cercopithecoidea indet* | Tibia | Shaft | | Medium | Adult |
| SWP 2804 | T60 | 10'2"-11'2" | *Cercopithecoidea indet* | Tibia | Prox | R | Small | Juvenile |
| SWP 2807 | V46 | 15'11'-16'11' | *Cercopithecoidea indet* | Calcaneus | Prox | L | Medium | Adult |
| SWP 2808 | Q43 | 31'9'-32'9' | *Cercopithecoidea indet* | Sacrum | Complete | | Medium | ? |
| SWP 2809 | V49 | 4'10'-5'10 | *Cercopithecoidea indet* | Pelvis | Ilium | L | Small | Adult |
| SWP 2810 | W47 | 18'10"-19'7" | *Papio* | Humerus | Disral and shaft fr | L | Medium | Adult |
| SWP 2811 | Q49 | 13’4”-14’4” | *Cercopithecoidea indet* | Pelvis | Ilium | L | Medium | Adult |
| SWP 2812 | W46 | 27'4"-28'4" | *Cercopithecoidea indet* | Rib | Shaft | L | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 2813 | Q44 | 35'7'-36'7' | *Papionina* | Ulna | Prox | R | Medium | Adult |
| SWP 2814 | V45 | 5'11'-6'11' | *Cercopithecoidea indet* | Manus 1st phal | Complete | | Medium | Adult |
| SWP 2816 | H39 | 21'8-22'8 | *Papio/Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 29d | D15 | ? | *Cercopithecoidea indet* | Tibia | Distal condyle | L | Medium | Adult |
| SWP 4000 | D18 | ? | *Cercopithecoidea indet* | Radius | Proximal | R | Small | Adult |
| SWP 4001 | D18 | | *Theropithecus* | Ulna | Proximal | R | Large | Adult |
| SWP 4002 | T45 | 13'4"-14' 4" | *Cercopithecoidea indet* | Femur | Lesser trochnater | L | Medium | Adult |
| SWP 4003 | | | *Cercopithecoidea indet* | Femur | Lat. Condyle | R | Small | |
| SWP 4004 | P49 | 26'3"-27'3" | *Cercopithecoidea indet* | Hamate | Complete | L | Small | Adult |
| SWP 4005 | ? | ? | *Papionina* | Radius | Head | | | |
| SWP 4006 | ? | ? | *Parapapio* | Humerus | Distal | ? | Medium | Adult |
| SWP 4007 | N45 | 31' 0" - 32' 0" | *Papio/Parapapio* | Ulna | Proximal | ? | Medium | Adult |
| SWP 4008 | N45 | 31' 0" - 32' 0" | *Papio/Parapapio* | Ulna | Proximal and shaft | L | Medium | Adult |
| SWP 4009 | S45 | 6' 3" - 7' 3" | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 4010 | X36 | 3’ 2” – 4’ 9” | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| SWP 4011 | S45 | 6' 3" - 7' 3" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4012 | X36 | 3' 2" - 4' 9" | *Cercopithecus sp* | Radius | Proximal | | Medium | Adult |
| SWP 4013 | S45 | 6' 3" - 7' 3" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4014 | S45 | 6' 3" - 7' 3" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4015 | N45 | 29' 1" - 30' 1" | *Papionina* | Ulna | Proximal | L | Large | Adult |
| SWP 4016 | N45 | 29' 1" - 30' 1" | *Papio/Parapapio* | Ulna | Proximal | L | Medium | Adult |
| SWP 4017 | W37 | 4' 2"- 5' 2" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4018 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Shaft | R | Medium | Adult |
| SWP 4019 | N46 | 28' 0' - 29' 0" | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 4020 | X 36 | 3’ 2” – 4’ 9” | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4021 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4022 | N46 | 28' 0" - 29' 0" | *Cercopithecoidea indet* | Radius | Proximal | | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4023 | N46 | 28' 0' - 29' 0" | *Cercopithecoidea indet* | Radius | Proximal | R | Medium | Adult |
| SWP 4024 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4025 | N46 | 28' 0' - 29' 0" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 4026 | X36 | 3' 2" – 4' 9" | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 4027 | X36 | 3' 2" - 4' 9" | *Cercopithecoidea indet* | Humerus | Head fragment | ?R | Medium | Adult |
| SWP 4028 | W37 | 4' 2"- 5' 2" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4029 | X36 | 3' 2" - 4' 9" | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| SWP 4030 | W37 | 4' 2" - 5' 2" | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 4031 | N47 | 25' 5" - 26' 5" | *Cercopithecoidea indet* | Femur | Shaft | ? | Large | Adult |
| SWP 4032 | ? | ? | *Cercopithecoidea indet* | Femur | Proximal | R | Large | Adult |
| SWP 4033 | ?N49 | 25' 3" - 26' 3" | *Cercopithecoidea indet* | Femur | Distal | R | Medium | Sub-adult |
| SWP 4034 | N49 | 25' 3" - 26' 3" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4035 | W37 | 4' 5" - 5' 2" | *Papionina* | Femur | Proximal | L | Medium | Adult |
| SWP 4036 | X36 | 3' 2" - 4' 9" | *Parapapio* | Humerus | Distal and shaft | R | Medium | Adult |
| SWP 4037 | N49 | 25' 3" - 26' 3" | *Cercopithecoidea indet* | Femur | Distal | L | Medium | Sub-adult |
| SWP 4038 | V37 | 5' 0" - 6' 0" | *Parapapio/papio* | Humerus | Distal | L | Medium | Adult |
| SWP 4039 | N49 | 25' 3" - 26' 3" | *Theropithecus sp* | Femur | Proximal | L | Medium | Adult |
| SWP 4040 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 4041 | N45 | 31' 0" - 32' 0" | *Parapapio/papio* | Humerus | Distal | L | Medium | Adult |
| SWP 4042 | W37 | 4' 5" - 5' 0" | *Papio* | Radius | Proximal | L | Medium | Adult |
| SWP 4043 | N46 | 28' 0" - 29' 0" | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| SWP 4044 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4045 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Femur | Proximal | L | Large | Adult |
| SWP 4046 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Humerus | Distal shaft | ? | Medium | Adult |
| SWP 4047 | W37 | 4' 5" - 5' 2" | *Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 4048 | V37 | 5' 0" - 6' 0" | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 4049 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4050 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4051 | N48 | 32' 0" - 33' 4" | *Cercopithecoidea indet* | Scapula | Corocoid and glenoid cavity | | | |
| SWP 4052 | V37 | 5' 9" - 6' 9" | *Cercopithecoidea indet* | Tibia | Shaft | ? | Medium | Adult |
| SWP 4053 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Femur | Shaft (2) | L | Medium | Adult |
| SWP 4055 | N49 | 25' 3" - 26' 3" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4056 | N47 | 35’ 9” – 36’ 9” | *Cercopithecoidea indet* | Rib | Head | R | Medium | Adult |
| SWP 4057 | N48 | 15' 11" - 16' 11" | *Cercopithecoidea indet* | Lunate | Complete | L | Medium | Adult |
| SWP 4058 | N48 | 15' 11" - 16' 11" | *Cercopithecoidea indet* | ?Hamate | Complete | ?L | Medium | Adult |
| SWP 4059 | P49 | 28’ 0” – 29’ 0 | *Papionina* | Radius | Proximal fragment | ? | Medium | Adult |
| SWP 4060 | N47 | 31' 9" - 32' 9" | *Cercopithecoidea indet* | Proximal foot phalanx | Complete | ? | Medium | Adult |
| SWP 4061 | N49 | 26' 0" - 27' 0" | *Cercopithecoidea indet* | Coccyx | Complete | | Medium | Juvenile |
| SWP 4062 | S49 | 8' 6" - 9' 6" | *Cercopithecoidea indet* | Iii metatarsal | Complete | R | Medium | Adult |
| SWP 4063 | P 45 | 32' 1" - 33' 1" | *Papionina* | Radius | Proximal | L | Small | Juvenile |
| SWP 4064 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Scapula | Body | L | Medium | Adult |
| SWP 4065 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4066 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4067 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4068 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4069 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4070 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4071 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4072 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4073 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4074 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4075 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4076 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4077 | N49 | 25' 3"- 26' 3" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4078 | W37 | 4' 2" - 5' 2" | *Cercopithecoidea indet* | Femur | Head | L | Small | Adult |
| SWP 4079 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Pelvis | Iluim | R | Medium | Adult |
| SWP 4080 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 4081 | V37 | 5' 0" - 6' 9" | *Parapapio* | Humerus | Distal with extensive shaft | L | Medium | Adult |
| SWP 4082 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Calcaneus | Complete | L | Large | Adult |
| SWP 4083 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4084 | W37 | 4' 5" - 5' 2" | *Papio/Parapapio* | Ulna | Proximal | R | Medium | Adult |
| SWP 4085 | X36 | 3' 2" – 4' 9" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Large | Adult |
| SWP 4086 | X36 | 3' 2" – 4' 9" | *Cercopithecoidea indet* | Femur | Head | L | Medium | Adult |
| SWP 4087 | W37 | 4' 5" - 5' 2" | *Papionina* | Radius | Proximal | L | Medium | Adult |
| SWP 4088 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Femur | Proximal fragment | R | Medium | Adult |
| SWP 4089 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Shaft fr | ? | Medium | Adult |
| SWP 4090 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4091 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4092 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Shaft | R | Medium | Adult |
| SWP 4093 | X36 | 3' 2" – 4' 9" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4094 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4095 | X36 | 3' 2" – 4' 9" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |
| SWP 4096 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Shaft | L | Medium | Adult |
| SWP 4097 | X36 | 3' 2" – 4' 9" | *Cercopithecoidea indet* | Ulna | Proximal | L | Medium | Adult |
| SWP 4098 | | | *Papionina* | Ulna | Proximal | R | Medium | Adult |
| SWP 4099 | V37 | 5' 0" - 6' 9" | *Papionina* | Humerus | Distal lateral epicondyle | L | Medium | Adult |
| SWP 4100 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Tibia | Disral and shaft fr | L | Medium | Adult |
| SWP 4101 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Tibia | Distal and shaft fragment | R | Medium | Adult |
| SWP 4102 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Long bone | Shaft fr | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4103 | V37 | 5' 0" - 6' 9" | *Papio/Parapapio* | Femur | Proximal | L | Medium | Adult |
| SWP 4104 | X36 | 3’ 2” – 4’ 9” | *Cercopithecoidea indet* | Femur | Head | L | Medium | Adult |
| SWP 4105 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Tibia | shaft fr | R | Medium | Adult |
| SWP 4106 | X36 | 3’ 2” – 4’ 9” | *Cercopithecoidea indet* | Femur long bone | Distal shaft | ? | Medium | Adult |
| SWP 4107 | W37 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Femur long bone | Distal shaft | ? | Medium | Adult |
| SWP 4108 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur long bone | Distal shaft | ? | Medium | Adult |
| SWP 4109 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Long bone | Shaft fragment | ? | Medium | Adult |
| SWP 4110 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Head fragment | ? | Medium | Adult |
| SWP 4111 | U51 | 4' 5" - 5' 2" | *Cercopithecoidea indet* | Patella | Complete | R | Medium | Adult |
| SWP 4112 | S49 | | *Cercopithecoidea indet* | 3metatarsal | Complete | R | Medium | Adult |
| SWP 4113 | N50 | | *Cercopithecoidea indet* | ?Metatarsal | Prox | ? | Medium | Adult |
| SWP 4114 | S45 | | *Cercopithecoidea indet* | Femur | Lateral condyle | R | Medium | Adult |
| SWP 4115 | S45 | | *Cercopithecoidea indet* | Ulna | Fr | ? | Medium | Adult |
| SWP 4116 | ? | | *Cercopithecoidea indet* | Ulna | Fr | ? | Medium | Adult |
| SWP 4117 | S45 | 6'3" - 7'3" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4118 | S45 | 6'3" - 7'3" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4119 | N46 | 28'0"-29'0" | *Cercopithecoidea indet* | Ulna | Prox | | Medium | Adult |
| SWP 4120 | N47 | 31'9"-32'9" | *Cercopithecoidea indet* | 2nd phalanx pes | Proximal | ? | Medium | Adult |
| SWP 4121 | N48 | 15'11"-16'11" | *Cercopithecoidea indet* | Scaphoid | Complete | L | Medium | Adult |
| SWP 4122 | S45 | 8'5"-9'5" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | ? | Medium | Adult |
| SWP 4123 | P49 | 26'3"-27'3" | *Cercopithecoidea indet* | Hamate | Complete | L | Medium | Adult |
| SWP 4124 | N48 | 32'0"-33'4" | *Cercopithecoidea indet* | Scapula | Coronoid process and glenoid fossa | R | Medium | Adult |
| SWP 4125 | N50 | 20'5"-21'5" | *Cercopithecoidea indet* | Navicular | Complete | R | Medium | Adult |
| SWP 4126 | N47 | 35'9"-36'9" | *Cercopithecoidea indet* | Vertebra | Body | ? | Medium | Adult |
| SWP 4127 | N47 | 35'9"-36'9" | *Cercopithecoidea indet* | 2nd rib | Body | L | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4128 | N47 | 35'9"-36'9" | *Cercopithecoidea indet* | Vertebra | Wing | ? | Medium | Adult |
| SWP 4129 | N45 | 29'1"-30'1" | *Cercopithecoidea indet* | Ulna | Olecranon | R | Medium | Adult |
| SWP 4130 | P49 | 28'0"-29'0" | *Cercopithecoidea indet* | Radius | Head | ? | Small | Adult |
| SWP 4132 | N49 | 26'0'-27'0" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | ? | Medium | Adult |
| SWP 4133 | N48 | 15'11"-16'11" | *Cercopithecoidea indet* | Rib | Head and shaft | R | Medium | Adult |
| SWP 4134 | N46 | 28'0'-29'0" | *Cercopithecoidea indet* | Humerus | Distal condyle | L | Medium | Adult |
| SWP 4135 | N46 | 28'0'-29'0" | *Cercopithecoidea indet* | Radius | Proximal and shaft | L | Medium | Adult |
| SWP 4136 | N46 | 28'0'-29'0" | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 4137 | S44 | 5'3" - 6'3" | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| SWP 4138 | S44 | 5'3" - 6'3" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4139 | S44 | 5'3" - 6'3" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| SWP 4140 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Shaft | L | Medium | Adult |
| SWP 4141 | X36 | 3'2"-9'9" | *Cercopithecoidea indet* | Humerus | Distal and shaft | R | Medium | Adult |
| SWP 4142 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Shaft | L | Medium | Adult |
| SWP 4143 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| SWP 4144 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Head and shaft | L | Medium | Adult |
| SWP 4145 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Shaft | L | Medium | Adult |
| SWP 4146 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Radius | Proximal and shaft | R | Medium | Adult |
| SWP 4147 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 4148 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Humerus | Distal and shaft | L | Medium | Adult |
| SWP 4149 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Breccia block skull & 3 long bones | | | Small | Sub-adult |
| SWP 4150 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Prox | L | Medium | Adult |
| SWP 4151 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Distal | ? | Medium | Adult |
| SWP 4152 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4153 | N49 | 25'3"-26'3" | *Theropithecus sp* | Femur | Proximal | R | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4154 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Shaft and distal condyle | R | Medium | Adult |
| SWP 4155 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4156 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4157 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4158 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4159 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4160 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4161 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4162 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4163 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4164 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4165 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Shaft fr | ? | Medium | Adult |
| SWP 4166 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4167 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4168 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4169 | N49 | 25'3"-26'3" | *Cercopithecoidea indet* | Femur | Fr | ? | Medium | Adult |
| SWP 4170 | N50 | 20'5"-21'5" | *Cercopithecoidea indet* | Cuneiform | Fr | R | Medium | Adult |
| SWP 4171 | N50 | 20'5"-21'5" | *Cercopithecoidea indet* | Metacarpal 3 | Distal | R | Medium | Adult |
| SWP 4172 | S46 | 22'7"-23'7" | *Cercopithecoidea indet* | Radius | Prox | ? | Small | Juvenile |
| SWP 4173 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4174 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4175 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Tibia | Shaft | ? | Medium | Adult |
| SWP 4176 | U51 | 4'5"-5'2" | *Cercopithecoidea indet* | Patella | Shaft | R | Medium | Adult |
| SWP 4177 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |
| SWP 4178 | W35 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4179 | W35 | 4'5"-5'2" | *Cercopithecoidea indet* | Fibula | Prox | ? | Medium | Adult |
| SWP 4180 | W35 | 4'5"-5'2" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4181 | W35 | 4'5"-5'2" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 4182 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Humerus | Distal shaft | L | Medium | Adult |
| SWP 4183 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Calcaneus | Complete | L | Medium | Adult |
| SWP 4184 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Calcaneus | Complete | R | Small | Adult |
| SWP 4185 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Prox | L | Medium | Adult |
| SWP 4186 | | | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| SWP 4187 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 4188 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Tibia | Distal | R | Medium | Adult |
| SWP 4189 | V37 | 5' 0" - 6' 9" | *Cercopithecoidea indet* | Femur | Distal condyles | R | Medium | Adult |
| SWP 4190 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Radius | Proximal shaft | L | Medium | Adult |
| SWP 4191 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Tibia | Distal shaft | R | Medium | Adult |
| SWP 4192 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4193 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 4194 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Long bone | Shaft | ? | Medium | Adult |
| SWP 4195 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4196 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4197 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4198 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4199 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4200 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Humerus | Distal shaft | L | Medium | Adult |
| SWP 4201 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Distal shaft | ? | Medium | Adult |
| SWP 4202 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 4203 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | R | Medium | Adult |
| SWP 4204 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Proximal | L | Medium | Adult |
| SWP 4205 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Humerus | Distal shaft | L | Medium | Adult |
| SWP 4206 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft fr | R | Medium | Adult |
| SWP 4207 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Distal shaft | R | Medium | Adult |
| SWP 4208 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Humerus | Distal shaft | ? | Small | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4209 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Proximal shaft | R | Medium | Adult |
| SWP 4210 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Ulna | Proximalshaft | ? | Medium | Adult |
| SWP 4211 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Tibia | Proximalshaft | ? | Medium | Adult |
| SWP 4212 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Proximalshaft | L | Medium | Adult |
| SWP 4213 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shadft | ? | Medium | Adult |
| SWP 4214 | V37 | 5'0"-6'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4215 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Femur | Shaft | ? | Medium | Adult |
| SWP 4216 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 4217 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 4218 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Ulna | Shaft | R | Medium | Adult |
| SWP 4219 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Radius | Shaft | R | Small | Adult |
| SWP 4220 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Femur | Head | R | Medium | Adult |
| SWP 4221 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Femur | Head | ? | Medium | Adult |
| SWP 4222 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Femur | Distal shaft | ? | Medium | Adult |
| SWP 4223 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Femur | Distal shaft | ? | Medium | Adult |
| SWP 4224 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Humerus | Shaft | ? | Medium | Adult |
| SWP 4225 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Tibia | Shaft | L | Medium | Adult |
| SWP 4226 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Humerus | Head | ?R | Medium | Adult |
| SWP 4227 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4228 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Iv metatarsal | Distal fra | L | Medium | Adult |
| SWP 4229 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Iii metatarsal | Distal | L | Medium | Adult |
| SWP 4230 | X36 | 3'2"-4'9" | *Cercopithecoidea indet* | Metapodial | Shaft | ? | Medium | Adult |
| SWP 4231 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Proximalshaft | R | Medium | Adult |
| SWP 4232 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Long bone | Shaft | ? | Medium | Adult |
| SWP 4233 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Distal shaft | ? | Small | Adult |
| SWP 4234 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Radius | Shaft | ? | Medium | Adult |
| SWP 4235 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |
| SWP 4236 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Ulna | Shaft | ? | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 4237 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Long bone | Shaft | ? | Medium | Adult |
| SWP 4238 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Shaft | ?L | Medium | Adult |
| SWP 4239 | W50 | 23'5"-24'5" | *Cercopithecoidea indet* | Humerus | Distal | R | Medium | Adult |
| SWP 4240 | W50 | 25'6'-26'6" | *Cercopithecoidea indet* | Phalanx | Complete | ? | Medium | Adult |
| SWP 4241 | W37 | 4'5"-5'2" | *Cercopithecoidea indet* | Femur | Proximal | R | Medium | Adult |
| SWP 4242 | N45 | 31'10"-32'10" | *Cercopithecoidea indet* | Ulna | Proximal | L | Medium | Adult |
| SWP 4243 | N45 | 31'10"-32'10" | *Parapapio* | Radius | Proximal | R | Medium | Adult |
| SWP 4244 | N45 | 31'10"-32'10" | *Cercopithecoidea indet* | Humerus | Distal | L | Medium | Adult |
| SWP 4245 | N45 | 31'10"-32'10" | *Cercopithecoidea indet* | Radius | Proximal | R | Small | Adult |
| SWP 4246 | D18 | ? | *Papio* | Humerus | Distal | R | Medium | Adult |
| SWP 4246 | D18 | ? | *Parapapio* | Humerus | Distal | R | Medium | Adult |
| SWP 4246 | D18 | ? | *Parapapio* | Humerus | Distal | L | Medium | Adult |

Table A4. Catalogue of specimens derived from StW 53

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| S94-6405 | V60 | 9'5"-10'9" | *Cercopithecoidea indet* | Patella | Complete | R | Medium | Adult |
| SWP 1163 | X53 | 12'10"-13'2" | *Colobinae indet* | Femur | Proximal fr | L | Medium | Adult |
| SWP 1198 | V57 | 10' 3" - 11' 0" | *Theropithecus* | Radius | proximal | L | Medium | Adult |
| SWP 1199 | V57 | 10' 3" - 11' 0" | *Parapapio* | Humerus | Proximal | R | Medium | Adult |
| SWP 1202 | V 60 | 15'0"-16'0" | *Cercopithecoidea indet* | Rib | ? | ? | Medium | Adult |
| SWP 1203 | V/W 60 | 12'8"-14'0" | *Papio/Parapapio* | Femur | Proximal | L | Medium | Adult |
| SWP 1204 | V/W 60 | 12'8"-14'0" | *Parapapio* | radius | proximal | L | Medium | Adult |
| SWP 1261 | W59 | 7' 6' - 8' 6" | *Cercopithecoidea indet* | Phalanx | Complete | ? | Medium | Adult |
| SWP 1261 | W59 | 7' 6' - 8' 6" | *Cercopithecoidea indet* | Phalanx | Complete | ? | Medium | Adult |
| SWP 1272 | W59 | 8'5"-9'5" | *Cercopithecoidea indet* | Ulna | proximal | R | Medium | Sub-adult |
| SWP 1278 | V59 | 11'0"-12'0" | *Cercopithecoidea indet* | Humerus | prox | ? | Medium | Adult |
| SWP 1279 | V59 | 9'0"-10'0" | *Cercopithecoidea indet* | Radius | proximal | ? | Medium | Adult |
| SWP 1287 | W58 | 14'11"-15'11" | *Parapapio* | humerus | Distal | | Medium | Adult |
| SWP 1304 | V60 | 10' 0" - 11' 0" | *Cercopithecoidea indet* | Metatarsal | Complete | L | Medium | Adult |
| SWP 1306 | W59 | 10'5"-11'5" | *Papionina* | Radius | Proximal | R | Medium | Adult |
| SWP 1307 | V60 | 12' 0" - 13' 0" | *Cercopithecoidea indet* | Calcaneus | Complete | L | Medium | Adult |
| SWP 1308 | V60 | 12' 0"- 13' 0" | *Papionina* | Radius | | L | Small | Juvenile |
| SWP 2357a,b | | | *Cercopithecoidea indet* | 2 Ulnae | | ? | Medium | Adult |
| SWP 2375 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Lumbar Vertebra | complete | ? | Medium | Adult |
| SWP 2376 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Tibia | shaft | ? | Medium | Juvenile |
| SWP 2377 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Tibia | prox | ? | Small | Juvenile |
| SWP 2378 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Calcaneus | almost complete | R | Medium | Adult |
| SWP 2382 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Tibia | Prox | r | Medium | juvenile |
| SWP 2383 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Calcaneus | complete | L | Medium | Adult |
| SWP 2384 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Tibia | shaft | ? | Medium | Adult |
| SWP 2385 | V60 | 13'0"-14'0" | *Papio* | humerus | head | R | Medium | Adult |
| SWP 2386 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Rib | head | ? | Medium | Adult |
| SWP 2387 | V60 | 13'0"-14'0" | *Cercopithecoidea indet* | Metapodial | shaft | ? | Medium | juvenile |
| SWP 2400 | V59 | 10'0"-10'9" | *Cercopithecoidea indet* | Calcaneus | complete | L | Medium | Adult |
| SWP 2401 | V59 | 10'0"-10'9" | *Cercopithecoidea indet* | Metapodial | distal | ? | Medium | Adult |
| SWP 2537 | V60 | | *Papio/Parapapio* | humerus | distal | | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| SWP 2677 | V60 | 14'0"15'0" | *Cercopithecoidea indet* | Lumbar Vertebra | complete | ? | Medium | adult |
| SWP 2796 | W59 | 7'5"-8'5" | *Cercopithecoidea indet* | Ulna | proximal | R | Small | Adult |
| SWP 2797 | W59 | 9'6"-10'6" | *Cercopithecoidea indet* | Tibia | distal | R | Medium | Sub-adult |
| SWP 2798 | W59 | 9'6"-10'6" | *Cercopithecoidea indet* | Tibia | proximal | R | Medium | Adult |
| SWP 2800 | V60 | 13'5"-14'5" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| SWP 2801 | V60 | 13'5"-14'5" | *Cercopithecoidea indet* | Rib | Shaft | R | Medium | Adult |
| SWP 2802 | V60 | 13'5"-14'5" | *Cercopithecoidea indet* | Rib | Shaft | ? | Medium | Adult |
| SWP 2676 | V60 | 17'0"-17'5" | *Cercopithecoidea indet* | ulna | shaft | ? | Small | Adult |

Table A5. Catalogue of specimens derived from the Oldowan Infill

| Specimen no | Provenancce | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| BP/3/18380 | S54 | 25'7"-26'7" | *Cercopithecoidea indet* | Rib | prox | L | Medium | Adult |
| BP/3/18382 | S54 | 25'7"-26'7" | *Papio/Parapapio* | Humerus | distal | L | Medium | Adult |
| BP/3/23015 | P54 | 32'10" - 34'10" | *Cercopithecoidea indet* | Fibula | Shaft | ? | Medium | Adult |
| S94-13415 | Q51 | 31'4"-32'4" | *Cercopithecoidea indet* | Tibia | Proximal | R | Medium | Adult |
| S94-13416 | Q51 | 31'4"-32'4" | *Cercopithecoidea indet* | Tibia | Shaft | R | Medium | Adult |
| S94-2420 | Q56 | 29'2"-30'2" | *Cercopithecoidea indet* | Vertebrae | Axis | | Medium | Adult |
| S94-2924 | Q55 | 26'7"-27'7" | *Cercopithecoidea indet* | Scapula | Fragment | R | Medium | Adult |
| S94-3142 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Rib | Head | R | Medium | Adult |
| S94-3143 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Rib | head | R | Medium | Adult |
| S94-3144 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Rib | head | L | Medium | Adult |
| S94-3145 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Rib | head | R | Medium | Adult |
| S94-3146 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Rib | Shaft | R | Medium | Adult |
| S94-3147 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Rib | shaft | R | Medium | Adult |
| S94-3149 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Caudal Vertebra | complete | | Medium | Adult |
| S94-3276 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | Rib | Shaft | ? | Medium | Adult |
| S94-3277 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | Rib | Shaft | ? | Medium | Adult |
| S94-3278 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | RIB | body | | Medium | Adult |
| S94-3279 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | Rib | body | ? | Medium | Adult |
| S94-3281 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | Rib | Shaft | ? | Medium | Adult |
| S94-3282 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | Rib | prox | | Medium | Adult |
| S94-3283 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| S94-3284 | Q51 | 29'4"-30'4" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| S94-6263 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Rib | Neck | L | Medium | Adult |
| S94-6264 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Rib | shaft | ? | Medium | Adult |
| S94-6266 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| S94-6267 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Lumbar Vertebra | Complete | | Medium | Adult |
| S94-6268 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | thoracic Vertebra | body | | Medium | Adult |

| Specimen no | Provenance | Level | Taxon | Element | Portion | Side | Size | Age |
|---|---|---|---|---|---|---|---|---|
| S94-6269 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Lumbar Vertebra | body | | Medium | Adult |
| S94-6289 | R51 | 27'8"-28'8" | *Cercopithecoidea indet* | Rib | Neck | R | Medium | Adult |
| S94-6290 | R51 | 27'8"-28'8" | *Cercopithecoidea indet* | Rib | Shaft | ? | Medium | Adult |
| S94-6291 | R51 | 27'8"-28'8" | *Cercopithecoidea indet* | Caudal Vertebra | Body | | Medium | Adult |
| S94-6292 | R51 | 27'8"-28'8" | *Cercopithecoidea indet* | thoracic Vertebra | body | | Medium | Adult |
| S94-6307 | R51 | 26'8"-27'8" | *Cercopithecoidea indet* | thoracic Vertebra | Body | | Medium | Adult |
| S94-6309 | R51 | 26'8"-27'8" | *Cercopithecoidea indet* | thoracic Vertebra | Body | | Medium | Adult |
| S94-6310 | R51 | 26'8"-27'8" | *Cercopithecoidea indet* | Rib | shaft | R | Medium | Adult |
| S94-6341 | R51 | 29'4"-30'4" | *Cercopithecoidea indet* | thoracic Vertebra | Complete | | Medium | Adult |
| S94-6342 | R51 | 29'4"-30'4" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| S95-6344 | R51 | 29'4"-30'4" | *Cercopithecoidea indet* | Rib | head | R | Medium | Adult |
| S95-6354 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | Rib | shaft | ? | Medium | Adult |
| S95-6355 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | Rib | shaft | ? | Medium | Adult |
| SWP 1120 | R56 | 10' 9" - 11' 9" | *Papio* | Humerus | Distal | R | Medium | Adult |
| SWP 1154 | U58 | 11' 0" - 12' 0" | *Papionina* | Humerus | Proximal fr | L | Medium | Adult |
| SWP 1167 | R55 | 15' 1" - 16' 1" | *Cercopithecoidea indet* | Tibia | Distal | R | Small | Adult |
| SWP 2109 | Q57 | 25'8"-26'8" | *Cercopithecoidea indet* | Pelvis | ilium | R | Medium | Adult |
| SWP 2144 | O58 | 21'11"-22'11" | *Cercopithecoidea indet* | humerus | Shaft | R | Medium | Adult |
| SWP 2177 | P54 | 26'1" - 27'1" | *Papio/Parapapio* | Radius | proximal | r | Medium | Adult |
| SWP 2184 | P54 | 32'10" - 34'10" | *Cercopithecoidea indet* | Ulna | Olecranon | L | Medium | Adult |
| SWP 2185 | P53 | 24'6"-25'6" | *Cercopithecoidea indet* | Calcaneus | complete | L | Medium | Adult |
| SWP 2193 | Q56 | 28'2"-29'2" | *Cercopithecoidea indet* | Ulna | Proximal | R | Medium | Adult |
| SWP 2194 | Q51 | 28'4"-29'4" | *Cercopithecoidea indet* | Ulna | prox | R | Medium | Adult |
| SWP 2195 | Q51 | 28'4"-29'4" | *Cercopithecoidea indet* | thoracic Vertebra | body | ? | Medium | Adult |
| SWP 2196 | Q51 | 28'4"-29'4" | *Cercopithecoidea indet* | Caudal | body | ? | Medium | Adult |

| | | | | Vertebra | | | | |
|---|---|---|---|---|---|---|---|---|
| **Specimen no** | **Provenance** | **Level** | ***Taxon*** | **Element** | **Portion** | **Size** | **Size** | **Age** |
| SWP 2197 | Q51 | 28'4"-29'4" | *Cercopithecoidea indet* | 1st phalanx | complete | ? | Medium | Adult |
| SWP 2199 | Q57 | 25'8"-26'8" | *Cercopithecoidea indet* | Pelvis | ilium | R | Medium | Adult |
| SWP 2200 | Q56 | 23'2"-24'2" | *Papio* | Radius | proximal | R | Medium | Adult |
| SWP 2203 | s55 | 24'8"-25'8" | *Cercopithecoidea indet* | 2nd metacarpal | proximal | L | Medium | Adult |
| SWP 2294 | R53 | 26'2"-27'2" | *Cercopithecoidea indet* | 1st phalanx | complete | ? | Medium | Adult |
| SWP 2295 | R53 | 26'2"-27'2" | *Cercopithecoidea indet* | Second Phalanx | proximal | ? | Medium | Adult |
| SWP 2296 | S54 | 22'7"-23'7" | *Papio/Parapapio* | Ulna | proximal | R | Medium | Adult |
| SWP 2297 | S55 | 25'8"-26'8" | *Cercopithecoidea indet* | Calcaneus | Complete | R | Medium | Adult |
| SWP 2302 | R55 | 32'4" - 33'4" | *Cercopithecoidea indet* | 3rd Metacarpal | complete | R | Medium | Adult |
| SWP 2409 | Q51 | 30'4" 31'4 | *Cercopithecoidea indet* | 3rd metatarsal | distal | R | Medium | Juvenile |
| SWP 2423 | Q56 | 32'2" - 33'2" | *Cercopithecoidea indet* | 1st phalanx | complete | ? | Medium | Adult |
| SWP 2426 | Q54 | 25'0"-26'0" | *Cercopithecoidea indet* | Calcaneus | complete | L | Medium | Adult |
| SWP 2437 | R55 | 25'4"-26'4" | *Cercopithecoidea indet* | 2nd metacarpal | complete | R | Medium | Adult |
| SWP 2438 | Q55 | 31'4" 32'4 | *Cercopithecoidea indet* | Ulna | Distal | L | Medium | Adult |
| SWP 2439 | Q55 | 34'4" 35'4 | *Cercopithecoidea indet* | fifth metacarpal | proximal | R | Medium | Adult |
| SWP 2442 | R55 | 19'4"-20'4" | *Cercopithecoidea indet* | 1st phalanx | complete | L | Medium | Adult |
| SWP 2445 | Q54 | 28'0"-29'0" | *Cercopithecoidea indet* | Talus | Fragment | L | Medium | Adult |
| SWP 2458 | Q50 | 28'11"-29'11" | *Cercopithecoidea indet* | Cerv Vertebra | Fragment | | Medium | Adult |
| SWP 2459 | Q50 | 28'11"-29'11" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| SWP 2467 | Q50 | 27'11"-28'11" | *Cercopithecoidea indet* | Cerv Vertebra | body | | Medium | Adult |
| SWP 2469 | Q51 | 30'4"-31'4" | *Cercopithecoidea indet* | Fourth metacarpal | Complete | r | Medium | Adult |
| SWP 2470 | R51 | 27'8"-28'8" | *Cercopithecoidea indet* | 1st phalanx | Proximal | ? | Medium | Adult |
| SWP 2473 | R51 | 29'8"-30'8" | *Cercopithecoidea indet* | Femur | Med condyle | R | Medium | Adult |
| **Specimen no** | **Provenance** | **Level** | ***Taxon*** | **Element** | **Portion** | **Size** | **Size** | **Age** |
| SWP 2474 | R51 | 29'8"-30'8" | *Cercopithecoidea indet* | Tibia | Distal | L | Medium | Adult |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SWP 2475 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Hamate | complete | L | Medium | Adult |
| SWP 2475 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | 2nd metacarpal | Proximal and shaft | R | Medium | Juvenile |
| SWP 2476 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Hamate | complete | R | Medium | Adult |
| SWP 2477 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Talus | complete | L | Small | Adult |
| SWP 2478 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | thoracic Vertebra | body | | Medium | Adult |
| SWP 2479 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| SWP 2480 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| SWP 2481 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | 5th metatarsal | Proximal and shaft | R | Medium | Juvenile |
| SWP 2482 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| SWP 2483 | R51 | 30'8"-31'8" | *Cercopithecoidea indet* | thoracic Vertebra | Fragment | | Medium | Adult |
| SWP 2573 | P53 | 31'6"-32'6" | *Cercopithecoidea indet* | Humerus | distal | L | Medium | Adult |
| SWP 2779 | S51 | 26'11"-27'11" | *Cercopithecoidea indet* | 4th metacarpal | proximal | R | Large | Adult |
| SWP 2784 | R56 | 25'4"-26'4" | *Cercopithecoidea indet* | Femur | shaft | R | Medium | Adult |
| SWP 2785 | R56 | 24'4"-25'4" | *Cercopithecoidea indet* | Calcaneus | distal art | L | Medium | Adult |
| SWP 2786 | R56 | 24'4"-25'4" | *Cercopithecoidea indet* | proximal phalange | complete | r | Medium | Adult |
| SWP 2788 | R57 | 22'4"-23'4" | *Papio* | Ulna | Olecranon | R | Medium | Adult |
| SWP 2792 | S53 | 22'7"23'7" | *Papio/Parapapio* | humerus | proximal | R | Medium | Adult |
| SWP 6267 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Vertebraebrae | Lumbar | | Medium | Adult |
| SWP 6269 | R51 | 28'8"-29'8" | *Cercopithecoidea indet* | Lumbar Vertebra | body | | Medium | Adult |

Table A6. Catalogue of specimens derived from the Member 5 West

| **Specimen no** | **Provenance** | **Level** | ***Taxon*** | **Element** | **Portion** | **Size** | **Size** | **Age** |
|---|---|---|---|---|---|---|---|---|
| S94-10778 | S63 | 10'1-11'1' | *Cercopithecoidea indet* | Femur | Shaft | | Medium | Adult |
| S94-10798 | S63 | 10' 1" - 11' 1" | *Cercopithecoidea indet* | Humerus | Complete | L | Medium | Adult |
| S94-8291 | O62 | 17'9" - 18'9" | *Cercopithecoidea indet* | Calcaneus | Fragment | | Medium | Adult |
| SWP 1119 | Q59 | 14'0"-15'0" | *Parapapio* | Humerus | Distal | ? | Medium | Adult |
| SWP 1154 | U58 | 11' 0" - 12' 0" | *Papionina* | Femur | Proximal fr | L | Medium | Adult |
| SWP 1177 | O62 | 15' 9" - 16' 9" | *Cercopithecoidea indet* | Tibia | Proximal | ? | Medium | Adult |
| SWP 1282 | U60 | 12' 5" - 13' 5" | *Cercopithecoidea indet* | Phalanx | Complete | ? | Medium | Adult |
| SWP 1284 | U60 | 9' 5" - 10' 5" | *Cercopithecoidea indet* | Talus | Complete | L | Small | Adult |
| SWP 2140 | Q61 | 15'5"-16'5" | *Cercopithecoidea indet* | Sternum | Body | | Medium | Adult |
| SWP 2141 | Q61 | 15'5"-16'5" | *Cercopithecoidea indet* | Sternum | Body | | Medium | Adult |
| SWP 2669 | N64 | 12'8"-13'8" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| SWP 2680 | N64 | 12'8"-13'8" | *Cercopithecoidea indet* | Ulna | Olecranon | R | Medium | Adult |
| SWP 2741 | O62 | 17'9" - 18'9" | Cercopithecoidea indet | Calcaneus | Fragment | L | Medium | Adult |
| SWP 2742 | R61 | 15'4"-16'10" | *Cercopithecoidea indet* | Calcaneus | Distal | L | Medium | Adult |
| SWP 2800 | U60 | 13'5"-14'5" | *Cercopithecoidea indet* | Caudal Vertebra | Complete | | Medium | Adult |
| SWP 2805 | U60 | 12'5"-13'5" | *Cercopithecoidea indet* | Talus | Art facet | L | Small | Adult |
| SWP 1014 | D11 | | *Cercopithecoidea indet* | Tibia | Distal | ? | Medium | Adult |

Table A7. Catalogue of specimens derived from the Member 6 and Post member 6

| **Specimen no** | **Provenance** | **Level** | ***Taxon*** | **Element** | **Portion** | **Side** | **Size** | **Age** |
|---|---|---|---|---|---|---|---|---|
| BP/3/19236 | P59 | 8'1" - 9'1" | *Cercopithecoidea indet* | Tibia | | L | Medium | Juvenile |
| BP/3/31470 | L63 | 15'6" - 16'6" | *Cercopithecus sp* | Humerus | Distal | L | Small | Adult |
| BP/3/32426 | J62 | 19'10" - 20'10" | *Cercopithecoidea indet* | Cervical Vertebra | Fragment | | Medium | Adult |
| BP/3/32871 | N59 | 21'0" - 22'0" | *Cercopithecoidea indet* | Tibia | Shaft | R | Medium | Adult |
| BP/3/33082 | N59 | 21'0" - 22'0" | *Cercopithecoidea indet* | Tibia | Shaft | R | Medium | Adult |
| BP/3/33411 | L62 | 14'5" - 15'5" | *Cercopithecoidea indet* | Thoracic Vertebra | Complete | | Medium | Adult |
| BP/3/33457 | M60 | 15'2" - 16'2" | *Cercopithecoidea indet* | Pelvis | Ilium | R | Medium | Adult |
| BP/3/33537 | H62 | 21'10" - 22'10" | *Cercopithecoidea indet* | Ulna | Shaft | L | Medium | Adult |
| BP/3/33605 | L62 | 14'5" - 15'5" | *Cercopithecoidea indet* | Ulna | Shaft | | Medium | Adult |
| S94-10064 | N60 | 13'9" - 14'9" | *Papio* | Humerus | Proximal | R | Small | Juvenile |
| S94-7694 | M61 | 12'8" - 13'8" | *Cercopithecoidea indet* | Calcaneus | Fragment | L | Medium | Adult |
| SE 2046 | | | *Cercopithecoidea indet* | Humerus | Shaft | R | Medium | Adult |
| SE 731 | | | *Cercopithecoidea indet* | 1st Phalanx | Complete | L | Medium | Adult |
| SWP 1111 | P60 | 16'4"-16'6" | *Cercopithecus sp* | Humerus | Distal | L | Small | Adult |
| SWP 1112 | O61 | 15'8"-16'8" | *Cercopithecus sp* | Ulna | Proximal | R | Small | Adult |
| SWP 1212 | O59 | 13' 6" - 14' 6" | *Cercopithecoidea indet* | Tibia | Shaft | ? | Large | Adult |
| SWP 1258 | O63 | 13'0"-14'0" | *Cercopithecoides* | Ulna | Proximal | R | Medium | Adult |
| SWP 1281 | Q58 | 14' 6" - 15' 3" | *Cercopithecoidea indet* | Humerus | Distal shaft | R | Medium | Adult |
| SWP 1285 | O61 | 16'8"-17'8" | *Cercopithecus sp* | Ulna | Proximal | L | Small | Adult |
| SWP 2140 | Q61 | 15'5"-16'5" | *Cercopithecoidea indet* | Sternum | Body | | Medium | Adult |
| SWP 2141 | Q61 | 15'5"-16'5" | *Cercopithecoidea indet* | Sternum | Body | | Medium | Adult |
| SWP 2149 | O61 | 18'8"- 19'1" | *Cercopithecoidea indet* | Talus | Complete | L | Medium | Adult |
| SWP 4054 | O61 | 18’8” - 19’ 1” | *Cercopithecoidea indet* | Scapula | Glenoid cavity and acromion | | Medium | Adult |
| SWP 4131 | O61 | 18'8"19'1" | *Cercopithecoidea indet* | Scapula | Glenoid cavity | ? | Medium | Adult |

**APPENDIX B**

## TABLES B1-B20. QUANTITATIVE ANALYSIS OF COMPARATIVE SAMPLES FROM THE UNIVERSITY OF THE WITWATERSRAND AND THE DITSONG MUSEUM OF NATURAL HISTORY

Table B1. Measurements derived from *Papio* sp humerus

| **SPECIMEN NO** | **ZA1227** | **Za1226** | **Za 1228** | **BP1/C 541** | **Za 1360** | **Za 1299** | **Za 740** | **Za 1232** | **Za 1357** | **Za 1231** |
|---|---|---|---|---|---|---|---|---|---|---|
| Length(maximum dist from the most proximal point on the head to the most distal point) | 195 | 181 | 194 | 210 | 205 | 242 | 182 | 186 | 182 | 184 |
| Proximal medio-lateral dimension | 29.9 | 27.6 | 32.9 | 27.1 | 27.5 | 34 | 31 | 28 | 25 | 27 |
| Bi-epicondylar breadth | 35.5 | 33.89 | 34.9 | 33.2 | 32 | 44 | 33 | 37.1 | 31 | 32 |
| Greater tuberosity diameter | 18.4 | 15.02 | 15.8 | 19.8 | 17.9 | 22 | 17 | 16.1 | 15 | 15 |
| Medial trochlear flange length | 16.9 | 17 | 17.26 | 16.9 | 18.9 | 23 | 16 | 18.9 | 16 | 17 |
| Lateral epicondyle to medial edge of trochlea | 34.9 | 29.3 | 33.9 | 30 | 31 | 36 | 30 | 32 | 28 | 28 |
| Distal articular breadth | 24.1 | 24.89 | 26.26 | 23.4 | 26.1 | 30 | 29 | 24.1 | 24 | 23.4 |
| Proximal distal height of capitulum | 14.9 | 14.5 | 13,69 | 14.4 | 16 | 18 | 14 | 16 | 14 | 14 |
| Humeral head diameter. | 22 | 12.69 | 21 | 18 | 24 | 26 | 21 | 24.5 | 24 | 22.2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Anterior-posterior length of humeral head | 26 | 24.2 | 24.02 | 24.8 | 28 | 31 | 24 | 23 | 23 | 24.5 |
| Maximum medio-lateral length of olecranon fossa | 13.4 | 13.07 | 13.771 | 15 | 12.1 | 26.2 | 14 | 13 | 13 | |
| Maximum proximo-distal length of olecranon fossa | 11 | 10.32 | 10.44 | 9.8 | 10.5 | 19 | 9 | | 13 | 14.9 |
| Angle of medial epicondyle relative to axis of distal articular surface | 35 | 30 | 40 | 40 | 40 | 40 | 35 | 40 | 40 | 40 |

Table B2. Measurements derived from *Papio* sp ulna

| **SPECIMEN NO** | ZA 1227 | Za 1226 | Za 1228 | Za 1299 | Za 740 | Za 1357 | Za 1232 | Za 1231 |
|---|---|---|---|---|---|---|---|---|
| Ulna length | 215 | 198 | 218 | 293 | 205 | 207 | 210 | 219 |
| Antero-posterior length of olecranon process | 24.9 | 24.04 | 25.67 | 34 | 26 | 24 | 25 | 22 |
| Proximo distal height of olecranon process | 14.1 | 11.03 | 16.15 | 7.9 | 12 | 10 | 16 | 9 |
| Medio-lateral breadth of olecranon process | 12.5 | 13.61 | 11.76 | 15 | 13 | 12 | 14 | 11 |
| Proximo distal height of trochlear notch | 16.6 | 18.9 | 18.11 | 19.9 | 17 | 16.5 | 15 | 14.2 |
| Anterior posterior length of distal end | 13.7 | 12.9 | 13.76 | 19.5 | 12 | 11 | 12 | 12 |
| Medio-lateral breadth of distal end | 9.6 | 8.43 | 9.64 | 12.1 | 14 | 14.5 | 19 | 12.3 |
| Proximo distal height of styloid process | 4.9 | 10.1 | 7.05 | 7 | 7 | 7.8 | 7 | 6.9 |

Table B3.Measurements derived from *Papio* sp radius

| **SPECIMEN NO** | Za 1227 | Za 1226 | Za 1228 | BPI/C 541 | Za 1360 | Za 740 | Za 1357 | Za 1232 | Za 1231 |
|---|---|---|---|---|---|---|---|---|---|
| Radial length | 196 | 180 | 199 | | 224 | 189 | | 186 | 188 |
| Maximum diameter of radial head | 17.7 | 16.5 | 17.44 | 16 | 18 | 17.2 | 14.2 | 16 | 14.9 |
| Perpendicular breadth of radial head | 16.8 | 15.83 | 16.36 | 14.9 | 16 | 14.9 | 9.5 | 15 | 16.2 |
| Proximo distal height of radial neck | 6.9 | 7.05 | 6.51 | 4.9 | 6 | 8 | 6.2 | 6 | 7 |
| Proximo distal height of radial neck and head | 12.4 | 13.99 | 15.41 | 12 | 13.1 | 13.1 | 12 | 12 | 12 |
| Anterior posterior width of radius neck | 10 | 9 | 9.3 | | 9.6 | 9.9 | 14 | 7.8 | 9.1 |
| Medio-lateral breadth of radius neck | 11.1 | 10.9 | 11.9 | | 12 | 12 | 12.5 | 11.9 | 11 |

Table B4. Measurements derived from *Papio* sp tibia

| **SPECIMEN NO** | ZA 1227 | ZA 1226 | Za 228 | Za 1360 | Za 1299 | Za 740 | Za 1357 | Za 1232 | Za 1231 |
|---|---|---|---|---|---|---|---|---|---|
| Tibia length | | 176 | 193 | 208 | 241 | 180 | 181 | 188 | 182 |
| Proximal-distal length of proximal tibia condyle | 22.11 | 27.18 | 25.6 | 9 | 13 | 10.1 | 9 | 12.8 | 122 |
| Medio-lateral breadth of lateral facet | 18.5 | 16.2 | 16.85 | 16 | 18.2 | 19 | 9 | 17 | 16.2 |
| Proximal distal breath of lateral facet | 6.54 | 9.29 | 8.15 | 6 | 9 | 7 | 6 | 8.5 | 9.2 |
| Medio-lateral breadth of medial facet | 16.22 | 15.67 | 14.98 | 15.1 | 19 | 17 | 9 | 15.3 | 15 |
| Proximo-distal breadth of medial facet | 6.73 | 7.77 | 9.01 | 9 | 12 | 8 | 6 | 7 | 9.2 |
| Maximum medio lateral length of distal tibia | 23.4 | 21.3 | 22.15 | 21.9 | 27 | 22 | 18 | 22 | 21 |
| Maximum proximo distal length of distal tibia (medial malleolus projection) | 10.16 | 9.98 | 10.65 | 10.5 | 13 | 9.2 | 10 | 9.8 | 14 |

Table B5. Measurements derived from *Papio* sp femur

| **SPECIMEN NO** | BPI/C 541 | ZA 1227 | Za 1226 | Za 1228 | Za 1360 | Za 1299 | Za 740 | Za 1357 | Za 1232 | Za1231 |
|---|---|---|---|---|---|---|---|---|---|---|
| Length | 235 | 223 | 228 | 219 | 238 | 287 | 210 | 205 | 220 | 214 |
| Anterior-posterior head diameter | 21.1 | 22 | 21.03 | 20.19 | 22 | 24 | 25 | 25 | 21 | 20.9 |
| Medio-lateral breadth of femur head | 18.6 | 18 | 17.9 | 18.09 | 19.8 | 22 | 17.9 | 19 | 18.6 | 17.5 |
| Proximo-distal height of femur head | | 20.9 | 20.1 | 19.9 | 22 | 25 | 19.3 | 19 | 21 | 21.5 |
| Greater trochanter projection/height | 11.6 | 11 | 10.1 | 10.69 | 13 | 14 | 9.8 | 9.5 | 12 | 12 |
| Neck diameter | 18.2 | 15.9 | 12.96 | 9.11 | 17.8 | 21 | 15.5 | 16.2 | 17 | 15 |
| Medio-lateral neck | 12.1 | 4 | 8.04 | 8.7 | 11 | 9.2 | 5.9 | 9.5 | 7 | 9 |
| Bi-epicondylar breadth/width | 33.3 | 40 | 33.86 | 35.21 | 35.9 | 42 | 35 | 28.5 | 36 | 35 |
| Patella surface rim height | 22 | 22 | 20.35 | 20.13 | 19 | 33 | 17.5 | 19 | 21 | 21 |
| Femoral length | 235 | 223 | 228 | 219 | 238 | 287 | 210 | 205 | 220 | 214 |
| Neck-shaft angle | 120 | 120 | 125 | 128 | 129 | 120 | 130 | 140 | 145 | 130 |
| Medial condyle width | 12 | 12 | 12.72 | 13.52 | 18 | 14 | 12 | 11 | 6.2 | 11 |
| Lateral condyle width | 10 | 9.9 | 10.7 | 11.1 | 12 | 12 | 9 | 8 | 9.7 | 9.8 |

Table B6. Measurements derived from *Cercopithecus aethiops* humerus

| **SPECIMEN NO** | V33 | Za 968 | Za 129 | Za 1224 | Za 864 | Za 862 |
|---|---|---|---|---|---|---|
| Length(maximum dist from the most proximal point on the head to the most distal point) | 135 | 132 | 139 | 129 | 188 | 114 |
| Proximal medio-lateral dimension | 17.7 | 18.2 | 18.1 | 16.9 | 15 | 16.2 |
| Bi-epicondylar breadth | 23.06 | 19.9 | 22.3 | 23.1 | 17 | 19.4 |
| Greater tuberosity diameter | 11.99 | 10.5 | 11.8 | 11.8 | 9 | 9.1 |
| Medial trochlear flange length | 10.91 | 10 | 12.1 | 10.1 | 8 | 10 |
| Lateral epicondyle to medial edge of trochlea | 17.89 | 18.2 | 18.9 | 19.4 | 14.7 | 16.2 |
| Distal articular breadth | 15.31 | 12.2 | 12.3 | 14 | 11 | 13.1 |
| Proximal distal height of capitulum | 9.4 | 9 | 9.1 | 9 | 12 | 7 |
| Humeral head diameter. | 13 | 14.9 | 12.5 | 13 | 12 | 14 |
| Anterior-posterior length of humeral head | 14.55 | 15.5 | 15 | 14.9 | 13 | 14 |
| Maximum medio-lateral length of olecranon fossa | 11.15 | 14.2 | 10.9 | 10.1 | 13 | 14 |
| Maximum proximo-distal length of olecranon fossa | 8.53 | 6.9 |  | 7 | 4.9 | 6 |
| Angle of medial epicondyle relative to axis of distal articular surface | 40 | 38 | 40 | 39 | 39 | 35 |

Table B7. Measurements derived from *Cercopithecus aethiops* ulna

| **SPECIMEN NO** | V33 | Za 973 | Za 968 | Za 1224 | Za 864 | Za 862 |
|---|---|---|---|---|---|---|
| Ulna length | 143 | 136 | 145 | 141.4 | 123 | 130 |
| Antero-posterior length of olecranon process | 13.78 | 13.52 | 11.8 | 9 | 11.2 | 12 |
| Proximo distal height of olecranon process | 10.82 | 9.05 | 6.9 | 6.1 | 13 | 6 |
| Medio-lateral breadth of olecranon process | 9.48 | 7.74 | 7.9 | 8 | 7.9 | 7.4 |
| Proximo distal height of trochlear notch | 10.34 | 11.82 | 9 | 8.9 | 9.8 | 7.6 |
| Anterior posterior length of distal end | 8.21 | 8.09 | 5.1 | 7 | 6 | 3 |
| Medio-lateral breadth of distal end | 6.38 | 6.67 | 4.9 | 6 | 5 | 4.9 |
| Proximo distal height of styloid process | 4.71 | 4.37 | 4.36 | 4.2 |  | 4 |

Table B8. Measurements derived from *Cercopithecus aethiops* radius

| **SPECIMEN NO** | V33 | Za 973 | BPI/C 294 | Za 12s | Za 968 | Za 1244 | Za 864 | Za 862 |
|---|---|---|---|---|---|---|---|---|
| Radial length | 131 | 122 | | 125 | 126 | 131 | 118 | |
| Maximum diameter of radial head | 9.89 | 10.02 | 10 | 8.9 | 9.1 | 10 | 8.5 | 9.1 |
| Perpendicular breadth of radial head | 9.37 | 8.98 | 9 | 8.2 | 9 | 8.9 | 7.8 | 8 |
| Proximo distal height of radial neck | 6.65 | 4.27 | 8.5 | 4.5 | 6 | 6.1 | 6 | 4 |
| Proximo distal height of radial neck and head | 9.08 | 9.31 | 13 | 9.9 | 8.9 | 10 | 8 | 7.1 |
| Anterior posterior width of radius neck | 4 | 4.6 | | 4.1 | 4.8 | 5.2 | 3.9 | 3 |
| Medio-lateral breadth of radius neck | 6.2 | 6 | | 6.3 | 6.9 | 7 | 4.9 | 5 |

Table B9. Measurements derived from *Cercopithecus aethiops* femur

| **SPECIMEN NO** | BPI/C/295 | Za12s | v33 | Za 1129 | Za 968 | Za 1244 | Za 864 | Za 862 |
|---|---|---|---|---|---|---|---|---|
| Length | | 147 | 160 | 140 | 155 | 163 | 139 | 138 |
| Anterior-posterior head diameter | 14 | 12.82 | 13.23 | 11.89 | 13 | 12.1 | 10.9 | 11 |
| Medio-lateral breadth of femur head | 12.1 | 10.72 | 10.6 | 10.98 | 10.9 | 10.2 | 8.2 | 10 |
| Proximo-distal height of femur head | 8.2 | 12 | 12.9 | | 12 | 11.1 | 10.7 | 11 |
| Greater trochanter projection/height | 6.2 | 4.61 | 7.97 | 4.78 | 6.8 | 6.3 | 5.1 | 4.6 |
| Neck diameter | | 9.74 | 7.31 | 7.88 | 7.9 | 8 | 9.4 | 3.8 |
| Medio-lateral neck | 12.6 | 7.33 | 5.71 | 4.03 | 5 | 4 | 4.9 | 4 |
| Bi-epicondylar breadth/width | | 22.38 | 22.21 | 19.85 | 20.5 | 22 | 18 | 20.1 |
| Patella surface rim height | 15 | 14.92 | 14.76 | 13.22 | 11.3 | 15 | 9.9 | 13 |
| Femoral length | 150.39 | 147 | 160 | 140 | 155 | 163 | 139 | 138 |
| Neck-shaft angle | 100 | 112 | 114 | 110 | 110 | 110 | 140 | 145 |
| Medial condyle width | 7.5 | 7.67 | 8.54 | 7.11 | 7 | 7.1 | 7.4 | 5.5 |
| Lateral condyle width | 6.9 | 6.8 | 7.97 | 6.42 | 6 | 6.2 | 5 | 7 |

Table B10. Measurements derived from *Cercopithecus aethiops* tibia

| **SPECIMEN NO** | V33 | Za 973 | Za 968 | Za 129 | Za 1244 | Za 864 | Za 864 |
|---|---|---|---|---|---|---|---|
| Tibia length | 155 | 145 | 155 | 155 | 154 | 125 | 138 |
| Proximal-distal length of proximal tibia condyle | 14.88 | 14.79 | 6.1 | 8.1 | 8 | 9/6/ | 13/7.2 |
| Medio-lateral breadth of lateral facet | 11.71 | 10.01 | 9.8 | 11 | 10.1 | 8.7 | 9.6 |
| Proximal distal breath of lateral facet | 5.74 | 5.54 | 6.1 | 6.9 | 6 | 4.9 | 3.9 |
| Medio-lateral breadth of medial facet | 10.05 | 10.6 | 9.1 | 10 | 9 | 8.9 | 9 |
| Proximo-distal breadth of medial facet | 6.62 | 5.92 | 5.9 | 4.1 | 5 | 6 | 3 |
| Maximum medio lateral length of distal tibia | 15.54 | 14.62 | 15 | 13 | 15.9 | 12.9 | 13 |
| Maximum proximo distal length of distal tibia (medial malleolus projection) | 6.37 | 5.91 | 6.2 | 6.1 | 5.9 | 5 | 5 |

Table B11. Measurements derived from *Colobus* humerus

| **SPECIMEN NO** | A2/981 | A2/1437 | A2/ 807 | A2/155 |
|---|---|---|---|---|
| Length(maximum dist from the most proximal point on the head to the most distal point) | 181 | 174.9 | 154.9 | 161 |
| Proximal medio-lateral dimension | 26 | 23.8 | 20 | 24.9 |
| Bi-epicondylar breadth | 31.9 | 28.3 | 26 | 34.9 |
| Greater tuberosity diameter | 12.9 | 13.1 | 16.4 | 15.2 |
| Medial trochlear flange length | 12.3 | 11.2 | 9.1 | 11.7 |
| Lateral epicondyle to medial edge of trochlea | 26.1 | 28 | 21 | 25 |
| Distal articular breadth | 20.5 | 24.9 | 17.1 | 19.6 |
| Proximal distal height of capitulum | 10.2 | 14.9 | 8 | 9.9 |
| Humeral head diameter. | 18 | 19.9 | 15.5 | 19.8 |
| Anterior-posterior length of humeral head | 20.1 | 18.1 | 17 | 21 |
| Maximum medio-lateral length of olecranon fossa | 14 | 14.1 | 14.2 | 11 |
| Maximum proximo-distal length of olecranon fossa | 11 | 9.8 | 8 | 8 |
| Angle of medial epicondyle relative to axis of distal articular surface | 25 | 23 | 30 | 30 |

Table B12. Measurements derived from *Colobus* ulna

| **SPECIMEN NO** | A2 981 | A2 1437 | A2/807 | A2/155 |
|---|---|---|---|---|
| Ulna length | 184.9 | 182 | 163 | 180 |
| Antero-posterior length of olecranon process | 15 | 16 | 9.1 | 18 |
| Proximo distal height of olecranon process | 16.1 | 14.9 | 7.4 | 12.4 |
| Medio-lateral breadth of olecranon process | 11.8 | 9.5 | 10.9 | 10.8 |
| Proximo distal height of trochlear notch | 14.1 | 11.2 | 12 | 12 |
| Anterior posterior length of distal end | 12.8 | 6.8 | 10.1 | 11.8 |
| Medio-lateral breadth of distal end | 7.9 | 7.2 | 7.1 | 9.9 |
| Proximo distal height of styloid process | 4.9 | 6 | 4 | 6 |

Table B13. Measurements derived from *Colobus* radius

| **SPECIMEN NO** | Az/981 | Az 1437 | Az 807 | A2/155 |
|---|---|---|---|---|
| Radial length | 166.1 | 163.3 | 148 | 154 |
| Maximum diameter of radial head | 16 | 14.9 | 7.9 | 14.4 |
| Perpendicular breadth of radial head | 13.4 | 12 | 11 | 11.5 |
| Proximo distal height of radial neck | 13.3 | 6 | 6.1 | 6.1 |
| Proximo distal height of radial neck and head | 15 | 7.2 | 9.4 | 11 |
| Anterior posterior width of radius neck | 6 | 6.1 | 8.1 | 12 |
| Medio-lateral breadth of radius neck | 10.2 | 8.4 | 4.9 | 13.9 |

Table B14. Measurements derived from *Colobus* femur

| **SPECIMEN NO** | A2/981 | A2/1437 | A2/807 | A2/155 |
|---|---|---|---|---|
| Length | 234 | 222 | 205 | 212 |
| Anterior-posterior head diameter | 17.8 | 16.9 | 16 | 17.5 |
| Medio-lateral breadth of femur head | 13.8 | 13.8 | 12.8 | 15.7 |
| Proximo-distal height of femur head | 17 | 15.1 | 15.8 | 17 |
| Greater trochanter projection/height | 9.1 | 6.8 | 6.5 | 6 |
| Neck diameter | 15 | 14 | 9 | 16 |
| Medio-lateral neck | 8.9 | 13.2 | 6,5 | 6.5 |
| Bi-epicondylar breadth/width | 32.5 | 30.9 | 28 | 31 |
| Patella surface rim height | 22.4 | 20.9 | 20.1 | 24 |
| Femoral length | 234 | 222 | 205 | 212 |
| Neck-shaft angle | 135 | 140 | 130 | 127 |
| Medial condyle width | 11.6 | 10.8 | 8.1 | 11 |
| Lateral condyle width | 10.6 | 11 | 8.1 | 11 |

Table B15. Measurements derived from *Colobus* tibia

| **SPECIMEN NO** | Az/1437 | Az 981 | Az/ 807 | A2/155 |
|---|---|---|---|---|
| Tibia length | 205 | 215 | 187.9 | 204 |
| Proximal-distal length of proximal tibia condyle | 23.9/11.8 | 21/12.3 | 22.2 | 22.3/9.7 |
| Medio-lateral breadth of lateral facet | 13.1 | 14.9 | 11.4 | 10.3 |
| Proximal distal breath of lateral facet | 8.2 | 8.2 | 7.1 | 9.4 |
| Medio-lateral breadth of medial facet | 12 | 12 | 11.1 | 12.1 |
| Proximo-distal breadth of medial facet | 8.1 | 8.1 | 6.1 | 12.1 |
| Maximum medio lateral length of distal tibia | 16.8 | 17.9 | 14 | 17.8 |
| Maximum proximo distal length of distal tibia (medial malleolus projection) | 8 | 7.8 | 7 | 8 |

Table B16. Measurements derived from *Mandrillus sphinx* humerus

| **SPECIMEN NO** | A2/1971 |
|---|---|
| Length(maximum dist from the most proximal point on the head to the most distal point) | 195 |
| Proximal medio-lateral dimension | 26.6 |
| Bi-epicondylar breadth | 33 |
| Greater tuberosity diameter | 13 |
| Medial trochlear flange length | 13.2 |
| Lateral epicondyle to medial edge of trochlea | 26 |
| Distal articular breadth | 22.6 |
| Proximal distal height of capitulum | 11 |
| Humeral head diameter. | 21 |
| Anterior-posterior length of humeral head | 22.6 |
| Maximum medio-lateral length of olecranon fossa | 12.3 |
| Maximum proximo-distal length of olecranon fossa | 11 |
| Angle of medial epicondyle relative to axis of distal articular surface | 40 |

Table B17. Measurements derived from *Mandrillus sphinx* ulna

| **SPECIMEN NO** | A2/1971 | A2/1972 |
|---|---|---|
| Ulna length | 218 | 5 |
| Antero-posterior length of olecranon process | 21.2 | 21 |
| Proximo distal height of olecranon process | 10.3 | 6 |
| Medio-lateral breadth of olecranon process | 11 | 10.2 |
| Proximo distal height of trochlear notch | 13 | 13 |
| Anterior posterior length of distal end | 10 | 15 |
| Medio-lateral breadth of distal end | 13.5 | 15 |
| Proximo distal height of styloid process | 5 | |

Table B18. Measurements derived from *Mandrillus sphinx* radius

| **SPECIMEN NO** | A2/1971 | A2/1972 |
|---|---|---|
| Radial length | 202 | 197 |
| Maximum diameter of radial head | 15.2 | 15 |
| Perpendicular breadth of radial head | 14 | 13.1 |
| Proximo distal height of radial neck | 5.9 | 7 |
| Proximo distal height of radial neck and head | 12 | 12 |
| Anterior posterior width of radius neck | 10 | 8 |
| Medio-lateral breadth of radius neck | 10 | 10.5 |

Table B19. Measurements derived from *Mandrillus sphinx* femur

| **SPECIMEN NO** | Az 1972 | Az 1971 |
|---|---|---|
| length | 219 | 210 |
| anterior-posterior head diameter | 17.5 | 17.9 |
| medio-lateral breadth of femur head | 14.9 | 19.9 |
| proximo-distal height of femur head | 12.9 | 17.8 |
| greater trochanter projection/height | 6.6 | 7.4 |
| neck diameter | 9 | 8.7 |
| medio-lateral neck | 6 | 7 |
| Bi-epicondylar breadth/width | 31.3 | 29 |
| patella surface rim height | 23 | 19 |
| femoral length | 219 | 210 |
| neck-shaft angle | 135 | 125 |
| medial condyle width | 13 | 17.5 |
| lateral condyle width | 8.2 | 9.7 |

Table B20. Measurements derived from *Mandrillus sphinx* tibia

| **SPECIMEN NO** | A2/1972 |
|---|---|
| Tibia length | 199 |
| Proximal-distal length of proximal tibia condyle | 10.4 |
| Medio-lateral breadth of lateral facet | 12.3 |
| Proximal distal breath of lateral facet | 13.6 |
| Medio-lateral breadth of medial facet | 13.5 |
| Proximo-distal breadth of medial facet | 5.5 |
| Maximum medio lateral length of distal tibia | 17.5 |
| Maximum proximo distal length of distal tibia (medial malleolus projection) | 8.1 |

**TABLES B21- B53. MEASUREMENTS OF MODERN MONKEY TAXA DERIVED FROM THE P RIMATE MORPHOMETRICS ONLINE (PRIMO) DATABASE OF THE NEW YORK CONSORTIUM IN EVOLUTIONARY PRIMATOLOGY (NYCEP)**

Table B21. List of abbreviations used in the PRIMO NYCEP database

| ABBREVIATION | TRAIT |
|---|---|
| HLHDCP | Humeral head to capitulum |
| HLGTCP | Humeral greater tuberosity to capitulum |
| HHDWAP | Humeral head anterior to posterior |
| HHDWTR | Medio-lateral length of humeral head |
| HDTRWX | Width distal humerus |
| HDTRWA | Width distal humeral articulation |
| HDTRWT | Width humeral trochlea |
| HDLENT | Proximodistal length humeral trochlea |
| HDAPWX | Anterior posterior length of distal humerus |
| HDTROW | Transverse width of olecranon fossa |
| HBRFAP | Humerus anterior to posterior at brachioradialis flange |
| HBRFTR | Medio-lateral breadth of humerus at brachioradialis flange |
| HBRFLC | Humeral brachioradialis flange to capitulum |
| HBRFLH | Humeral brachioradialis flange to head |
| HADCAPW | Humerus anterior to posterior at anteriormost deltoid crest |
| HADCTRW | Humerus medio-lateral at anteriormost deltoid crest |
| HADCLHD | Humerus anteriormost deltoid crest to head |
| HADCLGT | Humerus anteriormost deltoid crest to greater tuberosity |
| HADCLCP | Humerus anteriormost deltoid crest to capitulum |
| HDDAAPW | Humerus anterior to posterior at distal end of deltoid articulation |
| HDDATRW | Humerus medio-lateral at distal end of deltoid articulation |
| HDDALCP | Humerus distal end of deltoid articulation to capitulum |
| HDDALHD | Humerus distal end of deltoid articulation to head |
| HWMXDEL | Maximum width of humeral deltoid plane |
| ULCBAS | Ulnar olecranon to head |
| ULCSTY | Ulnar olecranon to styloid |
| ULASTY | Ulnar coronoid to styloid |
| ULPXAB | Ulnar coronoid to anterior proximal trochlear notch |
| ULPXAC | Ulnar coronoid to olecranon |

| | |
|---|---|
| ULPXBC | Ulnar olecranon to anterior proximal trochlear notch |
| ULPXDE | Ulnar anterior to posterior thickness in trochlear notch |
| ULPXDC | Ulnar olecranon to trochlear notch |
| ULPXAR | Diameter of ulnar radial notch |
| ULPXFG | "Major axis" of ulnar trochlear articular surface |
| ULPXFH | Medial length of ulnar trochlear articular surface |
| ULPXRG | Lateral length of ulnar radio-trochlear articular surface |
| ULPXRF | Distal width of ulnar radio-trochlear articular surface |
| ULPXAH | "Minor axis" of ulnar trochlear articular surface |
| UOLTRW | medio-lateral breadth of ulnar olecranon |
| UOLAPW | Anterior posterior  length of ulnar olecranon |
| UOLDEP | Depth of ulnar trochlear notch |
| URADEP | Depth of ulnar radial notch |
| ULANGL | Proximal ulnar angle |
| UDSTYH | Length of ulnar styloid process |
| UDWXAP | anterior to posterior length of ulnar head |
| UDWXTR | Medio-lateral breadth of ulnar head |
| RNECKAP | Radial neck anterior to posterior |
| RNECKML | Medio-lateral breadth of radial neck |
| RTUBWID | medio-lateral breadth of radial shaft at tuberosity |
| RSHAFTAP | Anterior to posterior length of radius at midshaft |
| RSHAFTML | Medio-lateral length of radial midshaft |
| RLENBAS | Radial head to base |
| RLENSTY | Radial head to styloid |
| FHEADAP | Anterior to posterior length of femoral head |
| FHEADML | Medio-lateral breadth of femoral head |
| FHEADPD | Proximo-distal length of femoral head |
| FMAXML | Femoral head to greater trochanter |
| FAP | Femoral midshaft anterior to posterior |
| FTR | Femoral midshaft medio-lateral |
| FLENGTR | Femur greater trochanter to lateral condyle |
| FLEN | Femur head to medial condyle |

| | |
|---|---|
| FLENFOS | Femur fovea capitis to medial condyle |

Table B22a and b. Measurements derived from *Colobus* humeri

| *Taxon* | Sexno | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Colobus guereza occidentalis* | 1 | 148.3 | 148 | 20.9 | 20.5 | 27.3 | 17.3 | 10.2 | 10.5 | 14.9 | 11.6 | 8.9 | 10.1 |
| *Colobus guereza occidentalis* | 2 | 146.3 | 145.2 | 21.3 | 20.9 | 25.8 | 17.3 | 9.6 | 11.6 | 15.1 | 12.1 | 8.1 | 9.8 |
| *Colobus guereza occidentalis* | 1 | 158.96 | 158.6 | 22.05 | 23.58 | 31.55 | 24 | 13.78 | 12.73 | 16.55 | 12.66 | 10.47 | 11.37 |
| *Colobus guereza kikuyuensis* | 9 | 138.66 | 139.42 | 19.18 | 19.88 | 25.16 | 16.46 | 7.9 | 10.79 | 13.7 | 10.26 | 8.38 | 9.45 |
| *Colobus angolensis cottoni* | 2 | 142.68 | 142.47 | 21.43 | 21.48 | 25.51 | 19.61 | 11.46 | 10.22 | 14.23 | 11.63 | 8.64 | 12.07 |
| *Colobus angolensis cottoni* | 1 | 161.67 | 162.26 | 20.15 | 19.88 | 26.34 | 20.24 | 12.35 | 12.14 | 14.59 | 12.91 | 9.49 | 11.31 |
| *Colobus angolensis cottoni* | 1 | 152.51 | 152.16 | 22.71 | 22.69 | 28.77 | 21.3 | 12.87 | 13.29 | 15.81 | 11.89 | 9.77 | 10.06 |
| *"Colobus" freedmani* | 4 | 136.8 | 137.08 | 19.76 | 19.86 | 24.74 | 15.99 | 9.18 | 11.32 | 13.55 | 10.26 | 8.2 | 9.86 |

| *Colobus guereza occidentalis* | 1 | Hbrflc | Hbrflh | Hadcapw | Hadctrw | Hadclhd | Hadclgt | Hadclcp | Hddaapw | Hddatrw | Hddalcp | Hddalhd | Hwmxdel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Colobus guereza occidentalis* | 2 | 41.1 | 105.9 | 12.1 | 10.8 | 43.1 | 40.2 | 109.8 | 11.1 | 10.7 | 82.8 | 67 | 10.77 |
| *Colobus guereza occidentalis* | 1 | 39.3 | 107.5 | 11.9 | 12 | 51.9 | 49.1 | 97.3 | 10.3 | 10.4 | 81.5 | 65.5 | 9.77 |
| *Colobus guereza kikuyuensis* | 9 | 54.01 | 103.12 | 13.34 | 13.03 | 59.07 | 57.98 | 104.96 | 12.01 | 11.59 | 86.28 | 76.42 | 12.62 |
| *Colobus angolensis cottoni* | 2 | 51.36 | 86.87 | 12.05 | 10.41 | 46.16 | 46.63 | 91.23 | 9.03 | 9.95 | 71.03 | 71.68 | 11.55 |
| *Colobus angolensis cottoni* | 1 | 40.2 | 105.05 | 12.12 | 12.5 | 51.02 | 52.16 | 93.26 | 10.91 | 10.97 | 82.2 | 62.73 | 12.03 |
| *Colobus angolensis cottoni* | 1 | 49.66 | 113.87 | 12.72 | 11.26 | 54.38 | 53.44 | 108.87 | 11.23 | 10.91 | 87.74 | 74.5 | 12.25 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *"Colobus" freedmani* | 4 | 62.03 | 91.52 | 12.71 | 11.38 | 54.01 | 52.64 | 101.5 | 11.35 | 10.37 | 86.26 | 68.43 | 12.46 |

Table B23a and b. Measurements derived from *Colobus* ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR |
|---|---|---|---|---|---|---|---|---|---|
| *Colobus guereza occidentalis* | 163.6 | 167.9 | 147.3 | 11.4 | 22.2 | 12.5 | 9.1 | 14.9 | 11.3 |
| *Colobus guereza occidentalis* | 144.9 | 149.6 | 128.9 | 13 | 22.5 | 11.2 | 9.5 | 13 | 11.4 |

| TAXON | ULPXFG | ULPXFH | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | ULANGL |
|---|---|---|---|---|---|---|---|---|---|---|
| *Colobus guereza occidentalis* | 17.2 | 15.4 | 16.2 | 12.8 | 14.4 | 5.2 | 8.3 | 6.5 | 1.4 | 22 |
| *Colobus guereza occidentalis* | 17.7 | 15.3 | 17 | 14.4 | 16.1 | 5.3 | 8 | 6.7 | 2.4 | 34 |

Table B24. Measurements derived from *Colobus* radii

| TAXON | RNECKAP | RNECKML | RTUBWID | RSHAFTAP | RSHAFTML | RLENBAS | RLENSTY |
|---|---|---|---|---|---|---|---|
| *Colobus guereza occidentalis* | 5.3 | 7.5 | | | | 148.2 | 152 |
| *Colobus guereza occidentalis* | 5.5 | 7.4 | | | | 131.3 | 136.1 |

Table B25. Measurements derived from *Colobus* femora

| TAXON | FHEADML | FHEADPD | FAP | FTR | FLENGTR | FLEN | FLENFOS |
|---|---|---|---|---|---|---|---|
| *Colobus guereza occidentalis* | 15.8 | 15.3 | 12.6 | 11.8 | 202 | 199 | 193 |
| *Colobus guereza occidentalis* | 16.2 | 16 | 11.3 | 12.1 | 188 | 187 | 180 |
| *Colobus guereza matschiei* | | | 12.6 | 12.3 | | 205 | |
| *Colobus guereza matschiei* | | | 11.5 | 11 | | 193.3 | |
| *Colobus guereza matschiei* | | | 14 | 13 | | 212.2 | |
| *Colobus guereza matschiei* | | | 10.5 | 10.5 | | 173.2 | |
| *Colobus guereza matschiei* | | | 13.3 | 12.2 | | 192 | |
| *Colobus guereza matschiei* | | | 14 | 12.8 | | 206.8 | |
| *Colobus guereza matschiei* | | | 12 | 11.7 | | 199.5 | |
| *Colobus guereza matschiei* | | | 12.3 | 11.3 | | 187.8 | |
| *Colobus guereza matschiei* | | | 13.7 | 12.2 | | 203 | |
| *Colobus guereza matschiei* | | | 12.5 | 11.4 | | 189 | |
| *Colobus guereza matschiei* | | | 12.3 | 12.1 | | 184.5 | |
| *Colobus guereza matschiei* | | | 12.9 | 12.4 | | 185.2 | |
| *Colobus guereza matschiei* | | | 13.3 | 13.1 | | 206.6 | |
| *Colobus guereza matschiei* | | | 12.1 | 11.4 | | 190.2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Colobus guereza matschiei* | | | 11.8 | 11.4 | | 184.2 | |
| *Colobus guereza dodingae* | | | 12.9 | 11.8 | | 195.7 | |
| *Colobus guereza guereza* | | | 13.6 | 14.3 | | 208.5 | |
| *Colobus polykomos* | | | 12 | 11.7 | | 204.1 | |
| *Colobus angolensis palliatus* | | | 10.5 | 10.8 | | 192.6 | |
| *Colobus angolensis palliatus* | | | 13.7 | 12.3 | | 206.5 | |
| *Colobus angolensis palliatus* | | | 12.7 | 12.8 | | 206.5 | |

Table B26a and b. Measurements derived from *Procolobus* humeri

| TAXON | HLGTCP | HHDWAP | HHDWTR | HDTRWX | HDTRWA | HDTRWT | HDLENT | HDAPWX | HDTROW | HBRFAP | HBRFTR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Procolobus badius oustaleti* | 152.7 | 152.2 | 21.7 | 20.4 | 28.7 | 18.3 | 10.9 | 10.8 | 14.2 | 12.7 | 8.5 |
| *Procolobus badius oustaleti* | 163.6 | 162.5 | 23.9 | 22.4 | 19.4 | 11.4 | 14.9 | 12.2 | 15.1 | 12.8 | 9.9 |
| *Procolobus badius temmincki* | 132.13 | 132.65 | 18.52 | 19.55 | 24.62 | 19.48 | 8.93 | 12.15 | 13.37 | 10.37 | 8.42 |
| *Procolobus badius temmincki* | 141.6 | 142.6 | 19.32 | 19.76 | 25.52 | 19.84 | 10.25 | 10.93 | 13.38 | 10.85 | 7.94 |

| *Procolobus badius oustaleti* | HBRFLC | HBRFLH | HADCAPW | HADCTRW | HADCLHD | HADCLGT | HADCLCP | HDDAAPW | HDDATRW | HDDALCP | HDDALHD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Procolobus badius oustaleti* | 31 | 122.6 | 13.7 | 11 | 41.7 | 38.8 | 116.5 | 9.9 | 10.5 | 92 | 62.5 |
| *Procolobus badius tephroscelles* | 34 | 130 | 14.9 | 12.5 | 51.2 | 48 | 117.7 | 11.3 | 12.4 | 93.4 | 72.2 |
| *Procolobus badius temmincki* | 48.62 | 83.73 | 12.21 | 12.09 | 40.52 | 40.4 | 95.97 | 9.87 | 10.8 | 77.98 | 60.81 |

Table B27 a and b. Measurements derived from *Procolobus* ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR | ULPXFG | ULPXFH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Procolobus badius oustaleti* | 162 | 166.5 | 146.5 | 12.5 | 22.1 | 11.1 | 8.7 | 13.4 | 11.3 | 18 | 13.9 |
| *Procolobus badius oustaleti* | 176 | 181.8 | 158.1 | 14.3 | 24.7 | 12.9 | 9 | 15.9 | 12.1 | 20.4 | 16.3 |
| *Procolobus badius temmincki* | 139.15 | 143.66 | 127.55 | 11.42 | 19.1 | 10.09 | 8.79 | 10.69 | 11.24 | 15.33 | 12.57 |
| *Procolobus badius temmincki* | 151.11 | 155.31 | 134.15 | 10.7 | 22.64 | 14.73 | 9.84 | 14.21 | 10.93 | 16.96 | 11.48 |

| TAXON | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | ULANGL | UDSTYH | UDWXAP | UDWXTR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Procolobus badius oustaleti* | 20.1 | 14.8 | 15.1 | 5.6 | 7.6 | 7 | 1.7 | 30 | | | |
| *Procolobus badius oustaleti* | 19.6 | 15.3 | 16.1 | 7.2 | 8.9 | 7.6 | 1.7 | 22 | | | |
| *Procolobus badius temmincki* | 13.57 | 12.86 | 12.78 | 7.09 | 8.53 | 4.95 | 1.42 | | 8.27 | 9.99 | 8.43 |
| *Procolobus badius temmincki* | 13.97 | 12.32 | 13.27 | 7.34 | 11.37 | 6.29 | 1.48 | | 9.3 | 11.01 | 8.52 |

Table B28. Measurements derived from *Procolobus* radii

| TAXON | RNECKAP | RNECKML | RTUBWID | RSHAFTAP | RSHAFTML | RLENBAS | RLENSTY |
|---|---|---|---|---|---|---|---|
| *Procolobus badius oustaleti* | 6.3 | 8.2 | | | | 146.2 | 150.2 |
| *Procolobus badius oustaleti* | 7.3 | 8.2 | | | | 156.7 | 162.5 |
| *Procolobus badius oustaleti* | 7.45 | 8.65 | 8.05 | 6.82 | 7 | 156.72 | 160.92 |
| *Procolobus badius tholloni* | 5.55 | 6.15 | 7.19 | 5.48 | 6.53 | 135.49 | 138.42 |
| *Procolobus badius temmincki* | 5.44 | 7.92 | 6.51 | 5.91 | 6.78 | 127.87 | 132.29 |
| *Procolobus badius temmincki* | 5.31 | 7.08 | 8.05 | 5.68 | 6.71 | 136.75 | 138.15 |

Table B29. Measurements derived from the *Procolobus* femora

| TAXON | FHEADAP | FHEADML | FHEADPD | FMAXML | FAP | FTR | FLENGTR | FLEN | FLENFOS |
|---|---|---|---|---|---|---|---|---|---|
| *Procolobus verus* | | | | | 8.8 | 8.5 | | 154 | |
| *Procolobus verus* | | | | | 9.9 | 8.9 | | 153.1 | |
| *Procolobus verus* | | | | | 8.7 | 8 | | 149.6 | |
| *Procolobus badius oustaleti* | | 16.2 | 15.7 | | 10.2 | 10.8 | 189 | 187 | 181 |
| *Procolobus badius oustaleti* | | 17.7 | 17.6 | | 12.1 | 12.5 | 199 | 205 | 200 |
| *Procolobus badius tephrosceles* | | | | | 11.3 | 10.3 | | 175.5 | |
| *Procolobus badius tholloni* | 14.82 | 11.55 | 14.12 | 29.22 | 9.37 | 10.18 | 177.66 | 176.58 | 170.29 |
| *Procolobus badius temmincki* | 14.8 | 11.54 | 13.11 | 28.39 | 10.08 | 10.34 | 178.14 | 177.1 | 171.29 |

Table B30. Measurements derived from *Paracolobus* humeri

| TAXON | HDTRWX | HDTRWA | HDTRWT | HDLENT | HDAPWX | HDTROW | HBRFAP | HBRFTR | HBRFLC |
|---|---|---|---|---|---|---|---|---|---|
| *Paracolobus chemeroni* | 44.5 | 32.1 | 19.7 | 23 | 27.8 | 21 | 17.2 | 19.5 | 92.6 |
| *Cf. Paracolobus mutiwa* | 44 | 32.3 | 18.5 | | 20 | 17 | | | |
| *Paracolobus mutiwa* | 48.26 | 32.05 | 18.31 | 17.73 | 22.57 | 17.88 | 15.46 | 18.5 | 82.5 |

Table 31. Measurements derived from *Paracolobus* femur

| TAXON | FAP | FTR | FLEN |
|---|---|---|---|
| *Paracolobus chemeroni* | 23 | 20.9 | 270 |

Table B32. Measurements derived from *Rhinocolobus* humeri

| TAXON | HDTRWX | HDTRWA | HDTRWT | HDLENT | HDAPWX | HDTROW | HBRFAP | HBRFTR | HBRFLC |
|---|---|---|---|---|---|---|---|---|---|
| Cf. Rhinocolobus turkanaensis | 51 | 37 | 22 | 23 | 24.5 | 20 | 14 | 27 | 55 |
| Cf. Rhinocolobus turkanaensis | 53 | 34.5 | 22 | 22 | | | | | |
| Rhinocolobus turkanaensis | 45.5 | 31 | 19.2 | 19.5 | 24.5 | 20.3 | 14.2 | 25.1 | 65 |

Table B33. Measurements derived from *Cercopithecoides* humeri

| Taxon | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cf. Cercopithecoides williamsi | 215 | 215.5 | 32 | 28 | 44 | 31.5 | 18 | 21 | 28 | 21 | 15 | 25 |
| Cercopithecoides meaveae | | | 31.5 | 29 | 35.8 | 23.8 | 14.2 | 18.5 | 19.5 | 18.8 | | |
| Cercopithecoides meaveae | | | | | 31.3 | 19.7 | 11 | 14.6 | 17.7 | 14.5 | | |

| | Hbrflc | Hbrflh | Hadcapw | Hadctrw | Hadclhd | Hadclgt | Hadclcp | Hddaapw | Hddatrw | Hddalcp | Hddalhd | Hwmxdel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cf. Cercopithecoides williamsi | 50 | 164 | 22 | 21 | 71 | 69 | 152 | 18.5 | 18 | 109 | 112.5 | 22.13 |

Table B34a and b. Measurements derived from *Cercopithecoides* ulnae

| TAXON | ULCBAS | ULCSTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR | ULPXFG | ULPXFH |
|---|---|---|---|---|---|---|---|---|---|---|
| Cf. *Cercopithecoides williamsi* | 208 | 215 | 23.5 | 40 | 23.5 | 18.5 | 24 | 22 | 38.5 | 27.5 |
| *Cercopithecoides meaveae* | | | 19 | 32 | 18 | 15 | 16 | 17.8 | 27.8 | 23 |

| TAXON | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | ULANGL | UDWXAP | UDWXTR |
|---|---|---|---|---|---|---|---|---|---|---|
| Cf. *Cercopithecoides williamsi* | 28 | 26.5 | 25.5 | 15 | 21 | 11.5 | 4.5 | 90 | 17 | 12.5 |
| *Cercopithecoides meaveae* | 21 | 21.8 | 22.3 | 13 | 17 | 9.7 | 5 | | | |

Table B35 a and b. Measurements derived from *Chlorocebus* humeri

| Taxon | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Chlorocebus aethiops pygerythrus* | 140.5 | 141.7 | 21.4 | 21.6 | 25.8 | 16.2 | 10.4 | 13.6 | 16.5 | 11.9 | 7.5 | 10.9 |
| *Chlorocebus aethiops pygerythrus* | 147.3 | 146 | 20.8 | 22 | 25.6 | 14.6 | 7.9 | 12.4 | 13.8 | 11.7 | 8.4 | 11.2 |
| *Chlorocebus aethiops pygerythrus* | 117.17 | 117.55 | 17.94 | 17.29 | 20.63 | 13.83 | 7.93 | 8.93 | 12.22 | 9.44 | 6.81 | 9.48 |

| | Hbrflc | Hbrflh | Hadcapw | Hadctrw | Hadclhd | Hadclgt | Hadclcp | Hddaapw | Hddatrw | Hddalcp | Hddalhd | Hwmxdel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Chlorocebus aethiops pygerythrus* | 33.8 | 107 | 13.3 | 13.8 | 45.6 | 44.2 | 101 | 12.7 | 10.2 | 80.5 | 59.8 | 11.42 |
| *Chlorocebus aethiops pygerythrus* | 38.7 | 107.2 | 13.5 | 12.3 | 46.1 | 42.2 | 107.1 | 11.5 | 10.6 | 81.4 | 65.3 | 11.5 |
| *Chlorocebus aethiops pygerythrus* | 26.91 | 88.51 | 9.25 | 10.26 | 44.29 | 43.37 | 73.68 | 8.21 | 10.29 | 57.15 | 61.22 | 8.09 |

Table B36. Measurements derived from *Chlorocebus* radius

| TAXON | RNECKAP | RNECKML | RLENBAS | RLENSTY |
|---|---|---|---|---|
| *Chlorocebus aethiops pygerythrus* | 5 | 7.8 | 130.8 | 134.7 |
| *Chlorocebus aethiops pygerythrus* | 5.4 | 7 | 145.8 | 144.4 |

Table B37 a and b. Measurements derived from *Chlorocebus* ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR | ULPXFG |
|---|---|---|---|---|---|---|---|---|---|---|
| *Chlorocebus aethiops pygerythrus* | 145.4 | 148.8 | 132.8 | 11.1 | 23.3 | 15.5 | 10 | 15 | 11.6 | 21.1 |
| *Chlorocebus aethiops pygerythrus* | 161.9 | 166.2 | 146.1 | 12.3 | 23.4 | 14.6 | 9.5 | 14.4 | 11.6 | 18.9 |

| TAXON | ULPXFH | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | ULANGL |
|---|---|---|---|---|---|---|---|---|---|
| *Chlorocebus aethiops pygerythrus* | 16 | 17.7 | 14.8 | 13.1 | 5.8 | 7.1 | 6.8 | 2.9 | 42 |
| *Chlorocebus aethiops pygerythrus* | 14.3 | 17 | 15.4 | 13.7 | 5.7 | 8 | 7 | 2.2 | 34 |

Table 38. Measurements derived from *Chlorocebus* femur

| TAXON | FHEADML | FHEADPD | FAP | FTR | FLENGTR | FLEN |
|---|---|---|---|---|---|---|
| *Chlorocebus aethiops pygerythrus* | 14.4 | 14.3 | 10.6 | 11.2 | 173 | 168 |
| *Chlorocebus aethiops pygerythrus* | 15.6 | 15.7 | 12.3 | 12 | 196 | 188 |
| *Chlorocebus aethiops pygerythrus* | | | 10.4 | 10.6 | | 163.8 |

Table B39. Measurements derived from *Cercopithecus* humeri

| *Taxon* | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cercopithecus aethiops* | 130.56 | 130.91 | 19.05 | 19.04 | 23.42 | 16.29 | 9.31 | 9.83 | 13.5 | 8.94 | 7.09 | 10.16 |
| *Cercopithecus mitis kandti* | 113.24 | 112.69 | 14.83 | 16.34 | 19.22 | 12.52 | 6.96 | 7.48 | 10.69 | 7.76 | 5.25 | 7.32 |
| *Cercopithecus mitis kandti* | 120.88 | 120.08 | 16.54 | 16.54 | 20.71 | 13.39 | 7.45 | 8.8 | 11.23 | 8.22 | 5.35 | 7.78 |
| *Cercopithecus mitis stuhlmani* | 146.84 | 145.45 | 18.37 | 19.29 | 23.28 | 13.59 | 7.14 | 10.04 | 12.18 | 9.04 | 5.48 | 7.99 |
| *Cercopithecus mitis stuhlmani* | 119.66 | 118.8 | 14.12 | 14.33 | 19.71 | 12.03 | 5.71 | 6.95 | 9.88 | 6.36 | 4.16 | 5.62 |
| *Cercopithecus albogularis kolbi* | 116.63 | 116.74 | 16.59 | 16.82 | 18.99 | 12.9 | 7.76 | 7.44 | 11.36 | 6.56 | 6.56 | 8.17 |
| *Cercopithecus ascanius katangae* | 126.92 | 126.71 | 19.58 | 18.78 | 22.84 | 15.68 | 7.83 | 10.63 | 13.99 | 8.67 | 7.02 | 10.15 |
| *Cercopithecus neglectus (uelensis)* | 130.18 | 128.23 | 18.79 | 17.13 | 22.76 | 15.58 | 8.92 | 8.29 | 10.95 | 4.96 | 5.61 | 9.46 |
| *Cercopithecus neglectus (uelensis)* | 138.02 | 137.99 | 20.78 | 20.63 | 25.26 | 16.77 | 9.99 | 12.6 | 15.35 | 10 | 7.77 | 11.21 |
| *Cercopithecus diana* | 110.45 | 110.62 | 15.91 | 15.74 | 19.29 | 12 | 6.52 | 9.14 | 11.72 | 7.07 | 6.5 | 7.47 |
| *Cercopithecus cephus* | 123.11 | 122.3 | 16.07 | 17.22 | 19.96 | 13.38 | 8 | 9.95 | 11.83 | 7.98 | 6.72 | 8.75 |

| *cephus* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cercopithecus hamlyni* | 120.06 | 120.96 | 17.62 | 16.61 | 20.76 | 14.76 | 8.54 | 9.08 | 12.27 | 6.32 | 6.7 | 9.44 |
| *Cercopithecus erythrotis* | 124.57 | 125.25 | 19.11 | 19.5 | 25.67 | 16.28 | 9.15 | 9.28 | 13.01 | 7.46 | 7.23 | 9.87 |
| *Cercopithecus pogonias denti* | 111.05 | 110.24 | 13.37 | 14.58 | 17.27 | 11.33 | 6.27 | 7.18 | 9.75 | 5.93 | 4.02 | 6.61 |
| *Cercopithecus pogonias denti* | 113.07 | 111.67 | 13.61 | 13.28 | 17.71 | 11.56 | 5.74 | 6.28 | 8.77 | 4.97 | 5.65 | 5.33 |
| *Taxon* | HBRFLC | HBRFLH | HADCAPW | HADCTRW | HADCLHD | HADCLGT | HADCLCP | HDDAAPW | HDDATRW | HDDALCP | HDDALHD | HWMXDEL |
| Cercopithecus pogonias denti | 29.32 | 75.99 | 6.13 | 6.59 | 36.17 | 34.02 | 75.29 | 5.09 | 5.36 | 55.58 | 55.38 | 6.43 |
| *Cercopithecus aethiops* | 31.53 | 100.75 | 10.89 | 10.32 | 44.11 | 43.49 | 87.87 | 8.37 | 9.87 | 71.14 | 62.89 | 10.07 |
| *Cercopithecus mitis kandti* | 22.73 | 84.01 | 7.45 | 7.65 | 40.54 | 38.92 | 75.3 | 6.61 | 7.52 | 56.89 | 58.93 | 8.19 |
| *Cercopithecus mitis kandti* | 30.79 | 92.65 | 8.8 | 8.28 | 40.57 | 39.41 | 80.66 | 7.1 | 7.98 | 64.99 | 57.12 | 8.04 |
| *Cercopithecus mitis stuhlmani* | 32.68 | 108.73 | 9.16 | 9.22 | 49.16 | 47.86 | 94.75 | 6.67 | 8.03 | 74.49 | 68.53 | 8.61 |
| *Cercopithecus mitis stuhlmani* | 25.44 | 89.99 | 7.2 | 6.74 | 33.87 | 31.78 | 82.82 | 4.54 | 5.87 | 57.25 | 58.8 | 6.62 |
| *Cercopithecus albogularis kolbi* | 28.66 | 90.91 | 8.53 | 8.26 | 39.69 | 38.51 | 79.64 | 7.33 | 8.75 | 59.52 | 61.25 | 8.72 |
| *Cercopithec* | 35.77 | 94.2 | 10.52 | 11.17 | 44.79 | 42.81 | 83.6 | 8.16 | 10.16 | 67.15 | 64.8 | 10.6 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *us ascanius katangae* | | | | | | | | | | | | |
| *Cercopithecus neglectus (uelensis)* | 32.18 | 92.27 | 9.72 | 11.13 | 49.49 | 46.57 | 79.88 | 6.81 | 8.82 | 57.42 | 70.27 | 12.48 |
| *Cercopithecus neglectus (uelensis)* | 37.6 | 100.52 | 12.27 | 12.18 | 45.58 | 44.77 | 92.75 | 11.23 | 11.72 | 79.21 | 59.65 | 11.73 |
| *Cercopithecus diana* | 28.03 | 81.36 | 8.36 | 9.93 | 39.14 | 72.6 | 73.65 | 7.37 | 8.74 | 59.29 | 56.46 | 9.65 |
| *Cercopithecus cephus cephus* | 33.09 | 90.39 | 9.64 | 9.27 | 41.26 | 39.49 | 83.88 | 7.93 | 8.85 | 65.27 | 60.13 | 8 |
| *Cercopithecus hamlyni* | 35.27 | 85.38 | 9.91 | 10.25 | 44.76 | 43.78 | 75.59 | 8.64 | 9.12 | 56.19 | 66.66 | 11.32 |
| *Cercopithecus erythrotis* | 54.04 | 74.68 | 10.8 | 9.02 | 44.3 | 42.58 | 82.73 | 7.65 | 10.01 | 57.88 | 68.49 | 10.73 |
| *Cercopithecus pogonias denti* | 26.74 | 80.21 | 6.52 | 6.95 | 34.4 | 32.05 | 74.86 | 5.36 | 5.79 | 54.85 | 54.14 | 6.66 |

Table B40 a and b. Measurements derived from *Cercopithecus* ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR | ULPXFG | ULPXFH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cercopithecus mitis kandti* | 108.69 | 112.49 | 96.78 | 7.65 | 16.53 | 9.28 | 6.42 | 10.41 | 8.16 | 13.82 | 10.04 |
| *Cercopithecus mitis kandti* | 117.04 | 120.82 | 105.06 | 7.43 | 16.77 | 9.41 | 6.5 | 10.62 | 8.8 | 14.54 | 9.55 |
| *Cercopithecus mitis stuhlmanni* | 156.53 | 162.08 | 141.83 | 9.38 | 20.5 | 10.76 | 9.16 | 13.73 | 12.18 | 19.14 | 14.22 |
| *Cercopithecus mitis stuhlmanni* | 152.83 | 157.07 | 136.09 | 10.84 | 22.89 | 12.99 | 8.66 | 14.22 | 10.69 | 17.84 | 13.69 |
| *Cercopithecus ascanius schmidti* | 131.9 | 136.08 | 119.94 | 8.47 | 17.83 | 9.89 | 7.45 | 10.69 | 9.21 | 15.12 | 11.05 |
| *Cercopithecus ascanius schmidti* | 134.76 | 137.99 | 121.67 | 8.81 | 18.3 | 10.64 | 7.4 | 11.46 | 8.69 | 16.65 | 12.18 |
| *Cercopithecus ascanius katangae* | 120.37 | 123.84 | 109.21 | 9.36 | 16.44 | 8.26 | 6.66 | 9.59 | 8.83 | 14.19 | 10.85 |
| *Cercopithecus diana* | 119.14 | 123.14 | 108.34 | 9.12 | 15.96 | 8.62 | 7.89 | 9.28 | 8.92 | 14.09 | 10.39 |
| *Cercopithecus cephus cephus* | 138.33 | 140.52 | 123.22 | 9.08 | 18.85 | 10.42 | 7.41 | 12.01 | 8.29 | 15.22 | 12.19 |
| *Cercopithecus hamlyni* | 137.1 | 140.62 | 125.53 | 7.24 | 15.62 | 8.42 | 7.48 | 10.43 | 9.35 | 15.13 | 10.93 |
| *Cercopithecus erythrotis* | 146.07 | 149.65 | 131.21 | 9.24 | 20.23 | 12.1 | 8.96 | 12.96 | 10.06 | 15.76 | 11.52 |
| *Cercopithecus pogonias denti* | 125.78 | 128.39 | 112.48 | 8.85 | 16.65 | 9.9 | 6.6 | 10.94 | 8.45 | 14.8 | 11.74 |
| *Cercopithecus mona denti* | 128.34 | 131.24 | 115.61 | 7.61 | 16.43 | 9.01 | 6.45 | 10.32 | 7.67 | 14.2 | 10.03 |

| TAXON | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | ULANGL | UDSTYH | UDWXAP | UDWXTR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cercopithecus mitis kandti* | 11.75 | 9.94 | 9.4 | 7.56 | 7.48 | 4.5 | 1.7 | 36 | 4.92 | 6.78 | 4.67 |
| *Cercopithecus mitis kandti* | 10.69 | 11.45 | 9.96 | 6.97 | 9.73 | 5.7 | 3 | 34 | 5.71 | 6.96 | 5.05 |
| *Cercopithecus mitis stuhlmanni* | 15.56 | 14.08 | 12.86 | 9.82 | 11.2 | 6.7 | 1.9 | 31 | 7.49 | 9.23 | 7.38 |
| *Cercopithecus mitis stuhlmanni* | 14.23 | 13.04 | 13.17 | 8.74 | 10.72 | 6.3 | 2 | 35 | 6.71 | 8.99 | 6.58 |
| *Cercopithecus ascanius schmidti* | 12.09 | 10.93 | 11.45 | 7.88 | 9.91 | 4.9 | 1.7 | 35 | 5.25 | 7.41 | 5.26 |
| *Cercopithecus ascanius schmidti* | 14.04 | 10.03 | 11.3 | 7.54 | 9.45 | 5.2 | 1.3 | 34 | 5.81 | 7.24 | 5.44 |
| *Cercopithecus ascanius katangae* | 12.93 | 10.84 | 11.26 | 6.87 | 8.97 | 5.1 | 1.4 | 37 | 5.72 | 7.43 | 5.59 |
| *Cercopithecus diana* | 12.65 | 11.38 | 10.08 | 7.58 | 10.28 | 5.11 | 2.7 | 39 | 5.07 | 7.26 | 4.96 |
| *Cercopithecus cephus cephus* | 13.31 | 11.54 | 12.01 | 7.6 | 10.09 | 5.3 | 1.81 | 39 | 5.64 | 7.72 | 5.48 |
| *Cercopithecus hamlyni* | 11.01 | 11.88 | 11.1 | 7.55 | 9.73 | 5.1 | 2.1 | 33 | 5.86 | 7.69 | 5.71 |
| *Cercopithecus erythrotis* | 14.81 | 11.54 | 10.57 | 8.91 | 9.71 | 4.6 | 2 | 34 | 7.01 | 8.68 | 5.73 |
| *Cercopithecus pogonias denti* | 12.67 | 10.27 | 11.5 | 7.31 | 9.52 | 4.81 | 1.4 | 37 | 5.74 | 7.98 | 5.59 |
| *Cercopithecus mona denti* | 11.37 | 9.92 | 11.52 | 7.02 | 9.9 | 4.4 | 1.3 | 30 | 6.05 | 7.54 | 5.75 |

Table B41. Measurements derived from *Cercopithecus* femora

| TAXON | FAP | FTR | FLEN |
|---|---|---|---|
| *Cercopithecus aethiops pygerythrus* | 8.6 | 9.2 | 141.5 |
| *Cercopithecus aethiops pygerythrus* | 11.4 | 11.7 | 171.6 |
| *Cercopithecus aethiops pygerythrus* | 8.9 | 9.1 | 151.4 |
| *Cercopithecus aethiops pygerythrus* | 8.6 | 9.2 | 137.7 |
| *Cercopithecus aethiops pygerythrus* | 8.9 | 9.1 | 137.2 |
| *Cercopithecus aethiops pygerythrus* | 8.9 | 8.3 | 126.8 |
| *Cercopithecus aethiops pygerythrus* | 8.8 | 7.5 | 139.6 |
| *Cercopithecus aethiops pygerythrus* | 8 | 7.4 | 138.1 |
| *Cercopithecus aethiops pygerythrus* | 8.5 | 8.4 | 140.7 |
| *Cercopithecus aethiops pygerythrus* | 10.3 | 11.4 | 163.6 |
| *Cercopithecus mitis* | 10.1 | 11.1 | 172.8 |
| *Cercopithecus mitis* | 11 | 11 | 181.2 |
| *Cercopithecus mitis* | 10.8 | 11 | 160.8 |
| *Cercopithecus mitis* | 10.1 | 10.9 | 167.5 |
| *Cercopithecus mitis* | 9.5 | 8.4 | 141.3 |
| *Cercopithecus mitis* | 8.4 | 8.1 | 139.4 |
| *Cercopithecus mitis* | 9.7 | 9.1 | 149.5 |
| *Cercopithecus mitis* | 12.2 | 11 | 182 |
| *Cercopithecus mitis* | 11 | 12.6 | 177.8 |
| *Cercopithecus mitis* | 10.6 | 10.4 | 172 |
| *Cercopithecus mitis* | 9.1 | 8.3 | 138.5 |
| *Cercopithecus mitis* | 9.1 | 8.2 | 143.9 |
| *Cercopithecus mitis* | 8.6 | 8 | 148 |
| *Cercopithecus ascanius* | 9.6 | 9.3 | 155.7 |
| *Cercopithecus ascanius* | 8.3 | 7.9 | 128.8 |
| *Cercopithecus ascanius* | 9.3 | 9 | 155 |
| *Cercopithecus ascanius* | 9.1 | 8.6 | 159.5 |
| *Cercopithecus ascanius* | 9.8 | 8.5 | 160.7 |
| *Cercopithecus neglectus* | 9 | 9.4 | 137.8 |

| | | | |
|---|---|---|---|
| *Cercopithecus neglectus* | 8.7 | 8.6 | 132.2 |
| *Cercopithecus neglectus* | 10.6 | 10.4 | 156.3 |
| *Cercopithecus neglectus* | 10.9 | 10.6 | 160.3 |
| *Cercopithecus neglectus* | 8.8 | 8.1 | 124.7 |
| *Cercopithecus cephus* | 7.8 | 8.1 | 131.8 |
| *Cercopithecus cephus* | 8.6 | 8.5 | 141.5 |
| *Cercopithecus cephus* | 10 | 9.4 | 114.9 |
| *Cercopithecus cephus* | 9 | 8.7 | 150.2 |
| *Cercopithecus cephus* | 7 | 7.5 | 128.5 |
| *Cercopithecus cephus* | 6.6 | 6.7 | 118 |

Table B42. Measurements derived from *Papio* humeri

| Taxon | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Papio hamadryas hamadryas* | 204 | 206 | 31.8 | 27.1 | 32.3 | 23.4 | 13.1 | 15.6 | 23.2 | 15 | 12.1 | 11.5 |
| *Papio hamadryas hamadryas* | 198.56 | 201.47 | 32.16 | 28.65 | 33.84 | 24.69 | 13.54 | 19.15 | 22.87 | 13.76 | 11.66 | 12.88 |
| *Papio hamadryas kindae* | 173.48 | 174. 16 | 25.58 | 25.12 | 35.8 | 22.5 | 11.78 | 17.44 | 22.61 | 12.12 | 10.37 | 11.24 |
| *Papio h. Cynocepha lus* | 239.78 | 242.93 | 40.94 | 32.51 | 43.95 | 32.11 | 17.89 | 22.54 | 27.6 | 15.92 | 14.81 | 17.19 |
| *Papio h. Anubis* | 192.62 | 193.84 | 28.51 | 26.39 | 35.07 | 25.87 | 14.23 | 17.06 | 22.22 | 14.57 | 13.07 | 13.66 |
| *Papio h. Anubis* | 242.8 | 244.85 | 38.16 | 36.81 | 45.93 | 30.9 | 16.26 | 24.76 | 27.72 | 17.62 | 15.64 | 15.45 |
| *Papio hamadryas anubis ?"neumann i"* | 238.26 | 239.47 | 37.23 | 34.41 | 44.91 | 29.05 | 15.83 | 22.67 | 28 | 17.85 | 14.66 | 16.23 |
| *Taxon* | Hbrflc | Hbrflh | Hadcapw | Hadctrw | Hadclhd | Hadclgt | Hadclcp | Hddaapw | Hddatrw | Hddalcp | Hddalhd | Hwmxdel |
| *Papio hamadryas hamadryas* | 73.1 | 131.3 | 16.5 | 12.2 | 73 | 71.7 | 135.6 | 10.5 | 14.3 | 110.9 | 95.1 | 14.71 |
| *Papio hamadryas hamadryas* | 66.47 | 132.06 | 15.99 | 13.44 | 50.32 | 52.48 | 149.37 | 13.12 | 12.7 | 100.08 | 94.58 | 14.21 |
| *Papio hamadryas kindae* | 57.99 | 114.05 | 13.02 | 10.94 | 64.56 | 65.43 | 111.17 | 13.44 | 10.37 | 91.61 | 81.54 | 11.06 |
| *Papio h. Cynocepha* | 90.68 | 146.98 | 23.02 | 18.03 | 91.06 | 93.74 | 157.2 | 18.86 | 15.69 | 138.67 | 105.05 | 21.27 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *lus* | | | | | | | | | | | | |
| *Papio h. Anubis* | 62.17 | 134.55 | 16.76 | 15.53 | 78.31 | 77.11 | 122.78 | 15.58 | 14.4 | 100.74 | 89.53 | 15.77 |
| papio h. anubis | 81.65 | 160.41 | 21.64 | 17.57 | 75.73 | 77.66 | 167.04 | 18.71 | 16.71 | 127.33 | 116.79 | 17.72 |
| papio hamadryas anubis ?"neumanni" | 71.88 | 158.5 | 20.12 | 14.43 | 107.62 | 108.85 | 135.5 | 18.98 | 14.17 | 119.54 | 122.67 | 19.67 |
| TAXON | HLHDCP | HLGTCP | HHDWAP | HHDWTR | HDTRWX | HDTRWA | HDTRWT | HDLENT | HDAPWX | HDTROW | HBRFAP | HBRFTR |
| Papio hamadryas ursinus | 215.32 | 217.87 | 29.51 | 28.45 | 34.13 | 23.18 | 13.46 | 17.9 | 22.17 | 14.39 | 12.26 | 15.42 |
| Papio hamadryas ursinus | 194.81 | 196.26 | 30 | 26.15 | 33.57 | 24.08 | 13.28 | 17.5 | 20.74 | 12.17 | 11.32 | 11.92 |
| Papio hamadryas ursinus | 225 | 228.16 | 36.32 | 32.97 | 42.54 | 28.97 | 16 | 22.6 | 25.16 | 15.25 | 15.99 | 16.91 |
| Papio hamadryas ursinus | 253.53 | 257.47 | 41.14 | 36.72 | 46.52 | 31.12 | 20.06 | 21.86 | 27.75 | 17.88 | 14.47 | 17.23 |
| Cf. Parapapio cf. jonesi | | | | | 42 | 29.5 | 18.4 | 17.3 | 23.8 | 16.1 | 14.7 | 21 |
| | HBRFLC | HBRFLH | HADCAPW | HADCTRW | HADCLHD | HADCLGT | HADCLCP | HDDAAPW | HDDATRW | HDDALCP | HDDALHD | HWMXDEL |
| Papio hamadryas ursinus | 64.98 | 150.16 | 16.63 | 13.84 | 67.2 | 68.56 | 151.11 | 14.22 | 15 | 118.91 | 94.94 | 15.19 |
| Papio hamadryas ursinus | 67.58 | 126.37 | 16.91 | 13.06 | 67.9 | 63.38 | 128.88 | 15.24 | 11.98 | 112.36 | 84.95 | 14.13 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Papio hamadryas ursinus | 75.81 | 150.64 | 21.77 | 17.73 | 96.47 | 99.09 | 129.35 | 18.5 | 15.7 | 118.56 | 111.52 | 20.3 |
| Papio hamadryas ursinus | 82.07 | 166.6 | 21.01 | 19.64 | 103.82 | 104.63 | 166.31 | 17.71 | 16.78 | 139.77 | 112.7 | 18.58 |
| Cf. Parapapio cf. jonesi | 52.5 | | | | | | | | | | | |
| TAXON | HLHDCP | HLGTCP | HHDWAP | HHDWTR | HDTRWX | HDTRWA | HDTRWT | HDLENT | HDAPWX | HDTROW | HBRFAP | HBRFTR |
| Papio hamadryas ursinus | 215.32 | 217.87 | 29.51 | 28.45 | 34.13 | 23.18 | 13.46 | 17.9 | 22.17 | 14.39 | 12.26 | 15.42 |
| Papio hamadryas ursinus | 194.81 | 196.26 | 30 | 26.15 | 33.57 | 24.08 | 13.28 | 17.5 | 20.74 | 12.17 | 11.32 | 11.92 |
| Papio hamadryas ursinus | 225 | 228.16 | 36.32 | 32.97 | 42.54 | 28.97 | 16 | 22.6 | 25.16 | 15.25 | 15.99 | 16.91 |
| Papio hamadryas ursinus | 253.53 | 257.47 | 41.14 | 36.72 | 46.52 | 31.12 | 20.06 | 21.86 | 27.75 | 17.88 | 14.47 | 17.23 |
| Papio hamadryas ursinus | 64.98 | 150.16 | 16.63 | 13.84 | 67.2 | 68.56 | 151.11 | 14.22 | 15 | 118.91 | 94.94 | 15.19 |
| Papio hamadryas ursinus | 67.58 | 126.37 | 16.91 | 13.06 | 67.9 | 63.38 | 128.88 | 15.24 | 11.98 | 112.36 | 84.95 | 14.13 |
| Papio hamadryas ursinus | 75.81 | 150.64 | 21.77 | 17.73 | 96.47 | 99.09 | 129.35 | 18.5 | 15.7 | 118.56 | 111.52 | 20.3 |
| Papio hamadryas ursinus | 82.07 | 166.6 | 21.01 | 19.64 | 103.82 | 104.63 | 166.31 | 17.71 | 16.78 | 139.77 | 112.7 | 18.58 |

Table B43. Measurements derived from *Papio* radii

| TAXON | RNECKAP | RNECKML | RTUBWID | RSHAFTAP | RSHAFTML | RLENBAS | RLENSTY |
|---|---|---|---|---|---|---|---|
| *Papio hamadryas hamadryas* | 6.7 | 11.4 | 11.11 | 6.51 | 10.89 | 200 | 207 |
| *Papio hamadryas hamadryas* | 6.9 | 10.5 | | | | 210 | 217 |
| *Papio hamadryas kindae* | 11.15 | 7.85 | 11.46 | 8.91 | 6.15 | 192 | 197 |
| *Papio h. cynocephalus* | 9.89 | 13.42 | 15.1 | 10.6 | 12.65 | 258.79 | 262.66 |
| *Papio hamadryas anubis [heuglini]* | 8.9 | 12.18 | 13.5 | 9.5 | 12.65 | 227 | 232 |
| *Papio hamadryas anubis* | 9.74 | 13.66 | 15.27 | 9.6 | 15.19 | 248 | 256? |
| *Papio hamadryas anubis* | 9.29 | 11.54 | 12.4 | 8.54 | 11.13 | 194 | 198 |
| *Papio hamadryas ursinus* | 8.19 | 10.38 | 10.45 | 8.08 | 10.55 | 206.82 | 210.69 |
| *Papio hamadryas ursinus* | 9.77 | 13.08 | 13.99 | 10.21 | 15.3 | 228.57 | 236.01 |

Table B43 a and b. Measurements derived from *Papio* ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR |
|---|---|---|---|---|---|---|---|---|---|
| *Papio hamadryas hamadryas* | 215 | 221 | 201 | 18.7 | 31.7 | 17.8 | 13.2 | 19.2 | 16 |
| *Papio h. cynocephalus* | 275.67 | 282.48 | 256.26 | 25.24 | 41.29 | 29.38 | 20.03 | 28.56 | 22.7 |
| *Papio hamadryas anubis [heuglini]* | | | | 22 | 39 | 25 | 17.2 | 24.6 | 21.5 |
| *Papio h. anubis* | 210.27 | 216.13 | 192.7 | 17.72 | 31.82 | 18.35 | 14.3 | 19.49 | 18.31 |
| *Papio h. anubis* | 274.85 | 284.34 | 253.74 | 22.17 | 44.81 | 28.91 | 18.09 | 28.51 | 21.67 |
| *Papio hamadryas anubis ?"neumanni"* | 256.38 | 264.02 | 237.72 | 18.29 | 38.69 | 24.25 | 17.73 | 28.81 | 21.23 |
| *Papio hamadryas ursinus* | 224.16 | 230.6 | 207.5 | 15.8 | 29.72 | 17.14 | 13.06 | 19.28 | 17.64 |
| *Papio hamadryas ursinus* | 250.65 | 257.48 | 230.38 | 18.48 | 36.97 | 22.73 | 18.13 | 24.46 | 20.81 |

| TAXON | ULPXFG | ULPXFH | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | UDSTYH | UDWXAP | UDWXTR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Papio hamadryas hamadryas* | 28.4 | 22.4 | 26 | 20.8 | 20.2 | 11 | 17.2 | 8.3 | 5 | 11.15 | 12.36 | 8.56 |
| *Papio h. cynocephalus* | 33.6 | 28.68 | 28.01 | 29.36 | 21.92 | 15.56 | 17.83 | 10.9 | 6.1 | 11.66 | 16.14 | 11.83 |
| *Papio hamadryas anubis [heuglini]* | 37.3 | 27 | 32.8 | 26.5 | 22.6 | 13.9 | 19 | 11.5 | 4.7 | | | |
| *Papio h. anubis* | 26.09 | 21.33 | 21.9 | 22.87 | 19.05 | 10.57 | 15.56 | 8.55 | 5.5 | 12.62 | 10.82 | 7.93 |
| *Papio h. anubis* | 40.15 | 26.95 | 31.84 | 26.9 | 25.11 | 12.78 | 14.04 | 12.4 | 6.4 | 9.24 | 15.79 | 11.86 |
| *Papio hamadryas anubis ?"neumanni* | 35.63 | 25.35 | 29.65 | 25.24 | 21.72 | 12.45 | 17.36 | 11.2 | 6.3 | 12.03 | 15.24 | 10.82 |
| *Papio* | 28.8 | 21.6 | 23.93 | 22.37 | 18.03 | 10.84 | 12.27 | 8.3 | 6.73 | 11.59 | 12.16 | 8.91 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *hamadryas ursinus* | | | | | | | | | | | | |
| *Papio hamadryas ursinus* | 37.62 | 26.96 | 29.6 | 27.61 | 22.16 | 13.68 | 17.96 | 12.03 | 6.07 | 13.4 | 15.17 | 10.71 |

Table 45. Measurements derived from *Papio* femora

| TAXON | FHEADAP | FHEADML | FHEADPD | FMAXML | FAP | FTR | FLENGTR | FLEN | FLENFOS |
|---|---|---|---|---|---|---|---|---|---|
| *Papio hamadryas hamadryas* | 19.77 | 20.1 | 20 | 39.02 | 12.5 | 12.9 | 227 | 222 | 213.17 |
| *Papio hamadryas hamadryas* | | 20.5 | 20 | | 14 | 13.4 | 218 | 209 | |
| *Papio hamadryas hamadryas* | | | | | 15.3 | 15.5 | | 242.8 | |
| *Papio hamadryas hamadryas* | | | | | 15.6 | 14.3 | | 215.3 | |
| *Papio hamadryas hamadryas* | | | | | 15.8 | 15.1 | | 227.6 | |
| *Papio hamadryas hamadryas* | | | | | 15.2 | 16.4 | | 243.2 | |
| *Papio hamadryas kindae* | 19.1 | 16.53 | 18.34 | 41.13 | 10.77 | 11.09 | 216 | 211 | 200 |
| *Papio h. cynocephalus* | 24.19 | 23.18 | 24.08 | 58.47 | 16.87 | 17.74 | 302 | 289.5 | 278.61 |
| *Papio hamadryas cynocephalus* | | | | | 16.2 | 16.3 | | 279.8 | |
| *Papio hamadryas cynocephalus* | | | | | 16.3 | 14.4 | | 248.3 | |
| *Papio hamadryas cynocephalus* | | | | | 13.4 | 12.3 | | 196.4 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 19.4 | 18.1 | | 281.2 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 16.9 | 16.6 | | 258.1 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 17.1 | 16.9 | | 277.2 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 16 | 15.5 | | 235 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 16.3 | 17.7 | | 251.7 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 16 | 15.5 | | 246.5 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 16.5 | 16.4 | | 250.7 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 15.8 | 16.4 | | 244.6 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 15.4 | 16.6 | | 258.3 | |
| *Papio hamadryas* | | | | | 15.9 | 16.8 | | 256.2 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *cynocephalus--Darajani* | | | | | | | | | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 16 | 15.7 | | 257.3 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 15.8 | 16.8 | | 269.8 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 12.6 | 12.8 | | 209.2 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 13.1 | 12 | | 212.2 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 13.7 | 13 | | 200.7 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 14.1 | 12.8 | | 217.1 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 12.9 | 13 | | 204.8 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 13 | 11.9 | | 204.5 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 13.9 | 13.2 | | 210 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 13.8 | 12.9 | | 223.5 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 14 | 13.7 | | 226 | |
| *Papio hamadryas cynocephalus--Darajani* | | | | | 13.7 | 12.9 | | 217 | |
| *Papio hamadryas anubis [heuglini]* | 24.45 | 20.17 | 24.47 | 50.33 | 15.5 | 17.43 | | | |
| *Papio hamadryas anubis* | 25.1 | 20.83 | 24.36 | 56.17 | 16.47 | 18.12 | | | |
| *Papio hamadryas anubis* | 20.1 | 16.64 | 20.38 | 43.44 | 14.54 | 13.26 | 219 | 215 | 205 |
| *Papio hamadryas anubis "neumanni"* | | | | | 13.5 | 14.3 | | 198.3 | |
| *Papio hamadryas anubis* | | | | | 17.3 | 17.4 | | 255 | |
| *Papio hamadryas anubis* | | | | | 18.6 | 18.1 | | 254 | |
| *Papio hamadryas anubis "neumanni"* | | | | | 15.9 | 15.3 | | 228.5 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Papio hamadryas anubis "neumanni"* | | | | | 18.2 | 16.1 | | 246.5 | |
| *Papio hamadryas anubis "neumanni"* | | | | | 15.9 | 15 | | 215.8 | |
| *Papio hamadryas anubis "neumanni""* | | | | | 16.5 | 15.7 | | 226.2 | |
| *Papio hamadryas anubis "neumanni"* | | | | | 15 | 13.5 | | 220.3 | |
| *Papio hamadryas ursinus* | | | | | 12.7 | 13.8 | | 208.3 | |
| *Papio hamadryas ursinus* | | | | | 13.9 | 15.6 | | 221 | |
| *Papio hamadryas ursinus* | | | | | 16.4 | 17.2 | | 254 | |
| *Papio hamadryas ursinus* | | | | | 16.9 | 18.1 | | 221 | |
| *Papio hamadryas ursinus* | 19.44 | 18.06 | 19.64 | 40.32 | 13.02 | 13.17 | 227.24 | 222.02 | 215.1 |
| *Papio hamadryas ursinus* | 23.55 | 19.49 | 23.08 | 49.66 | 15.53 | 17.7 | 263.41 | 253.41 | 242.58 |

Table B46a and b. Measurements derived from *Mandrillus* humeri

| Taxon | Sexno | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Mandrillus sphinx* | 2 | 178.5 | 178.5 | 26.1 | 25.7 | 31.6 | 22 | 13.1 | 14.2 | 18.6 | 12.4 | 12.5 | 10 |
| *Mandrillus sphinx* | 1 | 259 | 261 | 38.9 | 36.2 | 44.3 | 28.5 | 16.1 | 21.4 | 27.7 | 13.1 | 20.4 | 15.2 |
| *Mandrillus sphinx* | 1 | 221.19 | 220.43 | 33.88 | 32.66 | 40.66 | 29.24 | 16.56 | 20.62 | 24.13 | 14.01 | 15.59 | 16.86 |
| *Mandrillus sphinx* | 2 | 174.98 | 174.2 | 21.45 | 23.3 | 28.26 | 21.83 | 12.23 | 13.48 | 17.3 | 10.76 | 11.6 | 12.95 |
| *Mandrillus sphinx* | 2 | 188.07 | 186.78 | 27.6 | 25.45 | 32.87 | 23.13 | 12.6 | 17.28 | 20.87 | 13.09 | 11.73 | 13.15 |
| *Mandrillus sphinx* | 1 | 253.32 | 250.64 | 40.92 | 39.57 | 49.94 | 33.44 | 18.01 | 25.48 | 27.58 | 16.19 | 16.61 | 22.78 |
| *Mandrillus sphinx* | 1 | 288 | 265.76 | 39.26 | 36.2 | 44 | 28.3 | 14.7 | 22.3 | 28 | 14 | 16.5 | 21 |
| *Mandrillus sphinx* | 2 | 184.38 | 183.96 | 25.72 | 24.86 | 29.05 | 20.98 | 10.8 | 16.26 | 18.76 | 12.19 | 10.8 | 14.05 |
| *Mandrillus sphinx* | 2 | 233.78 | 232.81 | 33.22 | 32.68 | 41.7 | 29 | 17.6 | 21.8 | 27.5 | 18 | 14.14 | 17.92 |
| *Mandrillus cf sphinx* | 5 | 240.23 | 241.23 | 36.73 | 36.26 | 47.19 | 31.14 | 14.71 | 22.21 | 30.95 | 16.76 | 17.87 | 22.96 |
| *Mandrillus ?leucophaeus* | 1 | 219.88 | 221.36 | 39.71 | 33.86 | 43.93 | 28.41 | 16.22 | 19.35 | 24.98 | 16.59 | 14.31 | 19.54 |
| *Mandrillus ?leucophaeus* | 1 | 175.66 | 180.26 | 29.63 | 31.63 | 41.5 | 26.91 | 15.15 | 19.6 | 23.66 | 14.14 | 14.56 | 16.57 |
| | | | | | | | | | | | | | |
| | | Hbrflc | Hbrflh | Hadcapw | Hadctrw | Hadclhd | Hadclgt | Hadclcp | Hddaapw | Hddatrw | Hddalcp | Hddalhd | Hwmxdel |
| *Mandrillus* | 2 | 57.7 | 114.5 | 12.3 | 12.6 | 53.3 | 56.6 | 111.2 | 12.2 | 9.8 | 89.4 | 88.9 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *sphinx* | | | | | | | | | | | | | |
| *Mandrillus sphinx* | 1 | 87 | 177.5 | 22.4 | 18.2 | 85.5 | 82 | 181.5 | 19.5 | 19.3 | 135.2 | 134.5 | 22.38 |
| *Mandrillus sphinx* | 1 | 74.39 | 145.24 | 21.44 | 17.67 | 78.99 | 80.18 | 140.15 | 16.19 | 15.85 | 103.75 | 114.15 | 17.87 |
| *Mandrillus sphinx* | 2 | 60.72 | 118.21 | 14.15 | 14.16 | 70.49 | 67.48 | 110.53 | 11.34 | 12.6 | 78.6 | 98.64 | 13.39 |
| *Mandrillus sphinx* | 2 | 66.14 | 119.75 | 14.62 | 13.41 | 51.91 | 49.67 | 138.54 | 12.02 | 13.05 | 91.99 | 93.66 | 13.18 |
| *Mandrillus sphinx* | 1 | 86.8 | 164.85 | 26.09 | 26.51 | 97.42 | 97.65 | 154.23 | 21.58 | 22.48 | 137.09 | 115.17 | 26.17 |
| *Mandrillus sphinx* | 1 | 94.55 | 172.89 | 26.55 | 25.36 | 87.12 | 89.38 | 179.78 | 19.7 | 22.9 | 138.57 | 132.01 | 28.33 |
| *Mandrillus sphinx* | 2 | 64.47 | 120.26 | 16.57 | 14.93 | 55.36 | 54.19 | 128.7 | 13.08 | 14.26 | 106.04 | 76.03 | 14.71 |
| *Mandrillus sphinx* | 2 | 84.16 | 151.27 | 22.61 | 17.51 | 87.51 | 86.57 | 148.01 | 17.64 | 15.12 | 117.29 | 115.8 | 19.83 |
| *Mandrillus cf sphinx* | 5 | 84.84 | 153.61 | 29.65 | 27.35 | 91.39 | 94.98 | 148.18 | 23.96 | 21.39 | 123.67 | 119.03 | 23.54 |
| *Mandrillus ?leucophaeus* | 1 | 68.5 | 143.03 | 25.11 | 18.78 | 86.33 | 83.48 | 146.54 | 23.81 | 17.9 | 127.3 | 91.79 | 23.56 |
| *Mandrillus ?leucophaeus* | 1 | 71.88 | 106.56 | 22.05 | 22.14 | 66.56 | 68.87 | 112.88 | 19.99 | 19.82 | 99.09 | 83.14 | 22.03 |

Table B47. Measurements derived from *Mandrillus* radii

| TAXON | RNECKAP | RNECKML | RTUBWID | RSHAFTAP | RSHAFTML | RLENBAS | RLENSTY |
|---|---|---|---|---|---|---|---|
| *Mandrillus sphinx* | 7 | 8 | | | | 179.5 | 184.3 |
| *Mandrillus sphinx* | 9.5 | 13.1 | 10.98 | 9.96 | 14.31 | 265 | 273 |
| *Mandrillus sphinx* | 7.17 | 8.49 | 9.73 | 7.08 | 9.21 | 186.06 | 190.92 |
| *Mandrillus sphinx* | 8.12 | 8.89 | 8.06 | 7.06 | 9.3 | 195.96 | 200.97 |
| *Mandrillus sphinx* | 11.86 | 15.18 | 11.66 | 11.47 | 16.74 | 248.4 | 255.84 |
| *Mandrillus sphinx* | 11.7 | 10.99 | 15.23 | 10.81 | 16.46 | 269.23 | 274.56 |
| *Mandrillus sphinx* | 8.24 | 8.63 | 9.96 | 6.97 | 10.5 | 185.64 | 188.34 |
| *Mandrillus sphinx* | 10.83 | 13.41 | 13.67 | 9.42 | 13.97 | 233.71 | 237.05 |
| *Mandrillus cf sphinx* | 12.49 | 16.19 | 15.71 | 13.12 | 18.21 | 247.31 | 260.09 |
| *Mandrillus ?leucophaeus* | 11.88 | 12.81 | 12.31 | 10.2 | 14.62 | 197.43 | 201.98 |

Table B48 a and b. Measurements derived from *Mandrillu*s ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR | ULPXFG | ULPXFH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Mandrillus sphinx* | 192 | 197 | 182 | 12.7 | 22.9 | 14.7 | 11.7 | 13.3 | 14.7 | 23.7 | 17.2 |
| *Mandrillus sphinx* | 286 | 294 | 271 | 17 | 37.5 | 25.8 | 17.8 | 24.2 | 20.3 | 33.6 | 24.8 |
| *Mandrillus sphinx* | 198.11 | 203.91 | 185.72 | 12.68 | 23.07 | 15.19 | 11.58 | 15.07 | 13.71 | 17.63 | 16.39 |
| *Mandrillus sphinx* | 206.57 | 213.07 | 195.54 | 14.99 | 24.97 | 15.32 | 12.7 | 14.88 | 15.33 | 24.45 | 18.75 |
| *Mandrillus sphinx* | 266.34 | 274.93 | 247.68 | 19.76 | 38.1 | 26.12 | 18.68 | 25.03 | 23.84 | 36.37 | 26.21 |
| *Mandrillus sphinx* | 287.34 | 294.76 | 271.64 | 18.3 | 34.2 | 24.4 | 17.8 | 20.6 | 19.2 | 33.6 | 23.9 |
| *Mandrillus sphinx* | 197.54 | 203.53 | 183.81 | 15.26 | 25.64 | 14.77 | 11.62 | 15.61 | 15.26 | 25.45 | 20.77 |
| *Mandrillus sphinx* | | | | 18.8 | 37.2 | 23.1 | 17.6 | 23.3 | 20.4 | 35.6 | 26.3 |
| *Mandrillus sphinx* | 251.22 | 252.97 | 226.99 | 18.8 | 37.2 | 23.1 | 17.6 | 23.3 | 20.4 | 35.6 | 26.3 |
| *Mandrillus cf sphinx* | 272.04 | 279.62 | 252.2 | 23.38 | 39.18 | 23.69 | 19.59 | 26.37 | 22.88 | 35.63 | 27.91 |
| *Mandrillus ?leucophaeus* | 208.76 | 215.81 | 191.11 | 16.7 | 30.29 | 20.43 | 15.05 | 20.94 | 18.74 | 29.91 | 23.13 |

| TAXON | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | ULANGL | UDSTYH | UDWXAP | UDWXTR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Mandrillus sphinx* | 22.5 | 18 | 15.7 | 8.2 | 10.2 | 6.9 | 2.7 | 50 | 8.6 | 12 | 7.3 |
| *Mandrillus sphinx* | 33.2 | 22.8 | 20.9 | 10.2 | 14.2 | 10.2 | 4.2 | 54 | 13.01 | 16.51 | 11.13 |
| *Mandrillus sphinx* | 18.95 | 15.78 | 13.92 | 8.61 | 13.46 | 7.58 | 3.15 | | 8.79 | 9.75 | 7.15 |
| *Mandrillus sphinx* | 18.5 | 16.89 | 16.84 | 9.47 | 14.35 | 7.14 | 2.36 | | 10.35 | 10.26 | 8.52 |
| *Mandrillus sphinx* | 29.53 | 25.96 | 22.93 | 15.09 | 20.35 | 10.44 | 6.5 | | 11.2 | 17.56 | 11.68 |
| *Mandrillus sphinx* | 32.6 | 24.3 | 20.3 | 15.2 | 17 | 10.3 | 4.7 | | 14.11 | 17.14 | 10.89 |
| *Mandrillus sphinx* | 20.29 | 18 | 18.49 | 9.47 | 12.18 | 6.77 | 3.8 | | 9.01 | 11.35 | 7.78 |
| *Mandrillus sphinx* | 29.8 | 27.8 | 21.4 | 14.6 | 21.5 | 11.5 | 6.7 | | | | |
| *Mandrillus sphinx* | 29.8 | 27.8 | 21.4 | 14.6 | 21.5 | 11.5 | 6.7 | | 6.39 | 15.39 | 9.17 |
| *Mandrillus cf sphinx* | 28.06 | 27.77 | 22.56 | 14.66 | 16.44 | 12.84 | 8.46 | | 8.91 | 16.21 | 11.84 |
| *Mandrillus ?leucophaeus* | 24.44 | 23.49 | 17.54 | 12.09 | 18.26 | 10.29 | 6.14 | | 8.04 | 15.35 | 12.79 |

Table B49. Measurements derived from *Mandrillus* femora

| TAXON | FHEADAP | FHEADML | FHEADPD | FMAXML | FAP | FTR | FLENGTR | FLEN | FLENFOS |
|---|---|---|---|---|---|---|---|---|---|
| *Mandrillus sphinx* | | 18.3 | 18.2 | | 11.5 | 11.4 | 207 | 201 | |
| *Mandrillus sphinx* | 24.59 | 25 | 24.3 | 56.73 | 19.2 | 18.3 | 297 | 290 | 279.75 |
| *Mandrillus sphinx* | 16.59 | 15.34 | 16.5 | 34.23 | 12.73 | 13.74 | 203.41 | 200.28 | 193.77 |
| *Mandrillus sphinx* | 18.78 | 17.39 | 18.19 | 35.97 | | | | | |
| *Mandrillus sphinx* | 28.12 | 25.21 | 27.04 | 58.57 | 19.06 | 19.84 | 288.51 | 282.16 | 269.83 |
| *Mandrillus sphinx* | 25.58 | 22.39 | 24.62 | 55.69 | 21.81 | 20.93 | 299.3 | 293 | 281.19 |
| *Mandrillus sphinx* | 17.38 | 14.31 | 17.11 | 35.71 | 13.52 | 13.99 | 208.76 | 208.27 | 200.93 |
| *Mandrillus sphinx* | 23.22 | 19.34 | 23.05 | 55.73 | 17.61 | 16.33 | 278.69 | 270.93 | 259.83 |
| *Mandrillus sphinx* | | | | | 20.2 | 18.6 | | 288 | |
| *Mandrillus cf sphinx* | 24.86 | 20.02 | 23.82 | 55.16 | 17.7 | 20.63 | 283.18 | 279.71 | 267.92 |
| *Mandrillus ?leucophaeus* | 20.92 | 19.06 | 20.67 | 47.87 | 16.06 | 16.17 | 215.93 | 212.67 | 202.08 |

Table B50. Measurements derived from *Theropithecus* humeri

| Taxon | Hlhdcp | Hlgtcp | Hhdwap | Hhdwtr | Hdtrwx | Hdtrwa | Hdtrwt | Hdlent | Hdapwx | Hdtrow | Hbrfap | Hbrftr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Theropithecus gelada* | 166.14 | 168.03 | 27.03 | 24.4 | 30.99 | 23.3 | 12.51 | 16.08 | 20 | 10.9 | 13.58 | 12.25 |
| *Theropithecus gelada* | 200 | 202 | 32.5 | 22.84 | 35 | 22.9 | 13.7 | 16.6 | 23.2 | 13.8 | 12.4 | 11.4 |
| *Theropithecus gelada* | 201.2 | 202 | 32 | 27.5 | 34 | 25 | 14 | 17.7 | 22.5 | 13 | 11.5 | 13 |
| *Theropithecus gelada* | 172 | 172.5 | 26 | 23.5 | 29.6 | 20.4 | 12.2 | 15.3 | 18.7 | 12 | 10 | 12 |
| *Theropithecus gelada* | 203.2 | 205 | 32 | 28 | 35 | 23.5 | 14 | 17.5 | 23 | 13 | 12 | 14.2 |
| *Theropithecus gelada* | 205.66 | 205.81 | 31.86 | 28.93 | 36.83 | 23.08 | 13.84 | 18.01 | 23.05 | 12.77 | 12.75 | 14.51 |
| *Theropithecus oswaldi oswaldi* | | | | | | 31.65 | 18.38 | 18.82 | 27.05 | | | |
| *Theropithecus oswaldi* | | | | | 46.5 | 34 | 22.5 | 26 | 29 | 21 | | |
| *Theropithecus oswaldi* | | | | | 47 | 32 | 20 | 22 | 28 | 18 | 17 | 21 |
| *Theropithecus oswaldi* | 264 | 267.5 | | | 54 | 39 | 23 | 26 | 32 | 21 | 19 | 25 |
| *Theropithecus oswaldi cf. leakeyi* | | | | | 52.5 | 34 | 21.5 | 23.5 | 30 | 20 | | |
| *Theropithecus oswaldi cf. darti* | | | | | 29.2 | 19.7 | 12.2 | 14.5 | 18.3 | 10.4 | 11 | 12.1 |
| *Theropithecus oswaldi cf. darti* | | | | | 36 | 23.5 | 14 | 19.5 | 23 | 13 | 12.5 | 15.5 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Theropithecus oswaldi cf. darti* | | | | | 35.2 | 23.3 | 13.8 | 19.5 | 23 | 12.7 | 14 | 16.2 |
| *Theropithecus oswaldi cf. darti* | | | | | 38 | 26.5 | 14.5 | 18 | 24 | 15 | | |
| *Theropithecus oswaldi cf. Darti* | | | | | 35.5 | 25 | 16 | 21 | 24 | 16.5 | 14.8 | 17 |
| *Theropithecus oswaldi cf. darti* | 166 | 166 | 24 | 24 | 28.3 | 19.5 | 12.5 | 16.5 | 18 | 11 | 10.5 | |
| *Theropithecus oswaldi cf. darti* | | | | | 29.5 | 21 | 12.3 | 17 | 18 | | | 12.5 |
| *Theropithecus oswaldi cf. darti* | | | | | 33.7 | 21.8 | 12.7 | 16.8 | 19 | | | |
| *Theropithecus oswaldi cf. darti* | | | | | 36 | 26 | 15.5 | 19 | 24 | 14.5 | 12.5 | 16 |
| *Cf. Theropithecus brumpti* | | | | | 45.5 | 30.5 | 19 | 26 | 31 | 18.5 | 17.5 | 23 |
| *Cf. Theropithecus brumpti* | | | | | 40 | 25.5 | 17 | 21.5 | 24.5 | 17 | 15.5 | 20 |
| *Theropithecus (Omopithecus) brumpti* | 220.87 | 219.64 | 31.11 | 36.53 | 46.52 | 32.53 | 19.44 | 17.46 | 30.95 | 16.79 | | |
| | HBRFLC | HBRFLH | HADCAPW | HADCTRW | HADCLHD | HADCLGT | HADCLCP | HDDAAPW | HDDATRW | HDDALCP | HDDALHD | HWMXDEL |
| *Theropithecus gelada* | 57.21 | 108.64 | 17.03 | 12.64 | 43.88 | 43.34 | 123.94 | 14.06 | 12.47 | 86.1 | 80.23 | 13.06 |
| *Theropithe* | 62.5 | 135 | 15.6 | 12.1 | 69.3 | 66.1 | 135.1 | 11.6 | 13.2 | 92.3 | 109.9 | 13.93 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *cus gelada* | | | | | | | | | | | | |
| *Theropithecus gelada* | 61 | 139 | 17.5 | 13 | 72 | 69 | 134 | 15.5 | 12 | 99 | 107 | |
| *Theropithecus gelada* | 52 | 118.5 | 15 | 11.2 | 61 | 59.3 | 116.5 | 12.5 | 10.5 | 79 | 94 | 11.6 |
| *Theropithecus gelada* | 59 | 142 | 18 | 14 | 67 | 65 | 137 | 14 | 13 | 96 | 108 | 16.2 |
| *Theropithecus gelada* | 59.71 | 146.96 | 17.84 | 13.76 | 58.32 | 56.03 | 161.77 | 15.21 | 13.52 | 100.26 | 106.91 | 16.62 |
| *Theropithecus oswaldi oswaldi* | | | | | | | | 20 | 17.5 | | | |
| *Theropithecus oswaldi cf. leakeyi* | | | | | | | | 26 | 23 | | | |
| *Theropithecus oswaldi* | 84.5 | 179 | 29 | 27 | 102.5 | 98.5 | 172 | 25 | 25 | 129.5 | 140 | |
| *Theropithecus oswaldi cf. darti* | 47.7 | | | | | | | 13.1 | 14.9 | 83.3 | | |
| *Theropithecus oswaldi cf. darti* | 56 | 109 | 16.2 | 15 | 53.5 | 52 | 114 | 13.5 | 14.5 | 86 | 84 | 16.2 |
| *Theropithecus oswaldi cf. darti* | 56 | | 22 | 20 | | | 138 | 17.5 | 17 | 105 | | |
| *Cf. Theropithecus brumpti* | 67 | | 24.5 | 21 | | | 126 | 21.5 | 18 | 95 | | |
| *Theropithecus (Omopithecus) brumpti* | | | 22.47 | 20.69 | 74.91 | 73.47 | 148.56 | | 25.14 | 122.29 | 95.86 | 20.85 |

Table B51. Measurements derived from *Theropithecus gelada* radius

| TAXON | RNECKAP | RNECKML | RTUBWID | RSHAFTAP | RSHAFTML | RLENBAS | RLENSTY |
|---|---|---|---|---|---|---|---|
| *Theropithecus gelada* | 6.94 | 9.1 | 11.06 | 7.45 | 9.44 | 179.61 | 186.38 |

Table B52 a and b. Measurements derived from *Theropithecus* ulnae

| TAXON | ULCBAS | ULCSTY | ULASTY | ULPXAB | ULPXAC | ULPXBC | ULPXDE | ULPXDC | ULPXAR | ULPXFG | ULPXFH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Theropithecus gelada* | 223 | 240 | 215 | 14.8 | 32.2 | 20.8 | 13.2 | 22.2 | 16.1 | 29.9 | 22.2 |
| *Theropithecus gelada* | 230.5 | 233 | 213 | 16 | 31 | 19.5 | 14.3 | 21.5 | 16.5 | 30.5 | 21 |
| *Theropithecus gelada* | 197 | 203 | 182 | 15.3 | 26.8 | 15.3 | 11.2 | 16.5 | 14.6 | 26.3 | 19.8 |
| *Theropithecus gelada* | 237 | 242.5 | 216.5 | 16.5 | 32.5 | 19.5 | 14 | 20 | 16.7 | 28.5 | 21.5 |
| Cf. *Theropithecus oswaldi* | | | | 17.8 | 33.1 | 19.3 | 16 | 20 | 19.2 | 31.5 | 23 |
| Cf. *Theropithecus oswaldi* | | | | 22.2 | 41.6 | 25 | 16.9 | 25.5 | 21.2 | 37.7 | 27.8 |
| *Theropithecus oswaldi* | | | | 20.5 | 35 | 17 | 17 | 20.5 | 24 | 40 | 27 |
| *Theropithecus oswaldi* | | | | 21.5 | 27 | 20.5 | 15.5 | 24.5 | 22.5 | 35.5 | 26.5 |
| *Theropithecus oswaldi cf. leakeyi* | | | | 20 | 46 | 33 | 23 | 30 | 26 | 46 | 30 |
| *Theropithecus oswaldi cf. darti* | | | | 13.9 | 24.9 | 15.4 | 12.6 | 15.2 | 13.7 | 22 | 15.1 |
| *Theropithecus oswaldi cf. darti* | | | | 18 | 30 | 16.5 | 14 | 18.2 | 15.5 | 28.2 | 21 |
| *Theropithecus oswaldi cf. darti* | | | | 12 | 34.2 | 20.3 | 14 | 21.2 | 18 | 30 | 21.2 |
| *Theropithecus oswaldi cf. darti* | | | | 13.5 | 26 | 14 | 11 | 16 | 14 | 25 | 18 |
| *Theropithecus oswaldi cf. darti* | | | | 16 | 27.5 | 15 | | 16.5 | | 25.5 | 18.5 |
| *Theropithecus oswaldi cf. darti* | | | | | | 18.2 | 14.1 | 17.5 | | | |
| *Theropithecus oswaldi cf. darti* | | | | 17 | | | 13 | | 16.5 | 25 | 19.5 |
| Cf. *Theropithecus brumpti* | | | | 17.5 | 32.7 | 20.7 | 16 | 18.9 | 18.7 | 30 | 23.4 |

| TAXON | ULPXRG | ULPXRF | ULPXAH | UOLTRW | UOLAPW | UOLDEP | URADEP | UDSTYH | UDWXAP | UDWXTR |
|---|---|---|---|---|---|---|---|---|---|---|
| *Theropithecus gelada* | 26 | 21.3 | 16.8 | 13 | 19 | 9.4 | 5.5 | | | |
| *Theropithecus gelada* | 26.2 | 23.7 | 17.6 | 14 | 18.5 | 8.5 | 4.8 | 5.8 | 13.4 | 9.5 |
| *Theropithecus gelada* | 22.2 | 18.9 | 15.9 | 10.8 | 14.2 | 7.4 | 4.2 | 4.9 | 11 | 8.1 |
| *Theropithecus gelada* | 23 | 22.5 | 18 | 13.5 | 19 | 8.5 | 4.3 | 5.5 | 12.5 | 9.4 |
| Cf. *Theropithecus oswaldi* | 28 | 24 | 20 | 12 | 17.3 | 9.4 | 4.3 | | | |
| Cf. *Theropithecus oswaldi* | 31.9 | 26 | 26.1 | 16 | 22.3 | 12.5 | 3.5 | | | |
| *Theropithecus oswaldi* | 34 | 30 | 24 | | | 11 | 5.5 | | | |
| *Theropithecus oswaldi* | 32 | 28 | 25.5 | 15 | 20.5 | 12 | | | | |
| *Theropithecus oswaldi cf. leakeyi* | 40 | 31 | 24.5 | 18 | 26 | 13 | 5 | | 18.5 | 14 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Theropithecus oswaldi cf. darti* | 19.5 | 17 | 16.1 | 9.8 | 14.1 | 6.9 | 2.7 | | | |
| *Theropithecus oswaldi cf. darti* | 27 | 18 | 20 | 12.5 | 16.7 | 7.7 | 3.5 | | | |
| *Theropithecus oswaldi cf. darti* | 26.3 | 21.5 | 21 | 12 | 18.7 | 10 | 4.5 | | | |
| *Theropithecus oswaldi cf. darti* | 21 | 17.5 | 22 | 10.2 | 13.2 | 7.4 | 3.5 | | | |
| *Theropithecus oswaldi cf. darti* | | | 19.5 | 10 | | 6.7 | | | | |
| *Theropithecus oswaldi cf. darti* | 24.4 | | | 12 | 17.8 | | | | | |
| *Theropithecus oswaldi cf. darti* | 24.5 | 25 | 18.5 | | | 9.1 | 3 | | | |
| Cf. *Theropithecus brumpti* | 26.8 | 23 | 25.8 | 12.1 | 21.2 | 8.9 | 3.3 | | | |

Table B53. Measurements derived from *Theropithecus* femora

| TAXON | FHEADAP | FHEADML | FHEADPD | FMAXML | FAP | FTR | FLENGTR | FLEN | FLENFOS |
|---|---|---|---|---|---|---|---|---|---|
| *Theropithecus gelada* | 17.9 | 15.83 | 17.87 | 35.56 | 12.03 | 14.24 | 179.28 | 173.79 | 165.51 |
| *Theropithecus gelada* | | | | | 14 | 13.4 | | 209 | |
| *Theropithecus oswaldi cf. Leakeyi* | | | | | 26 | 25 | | 284 | |

# QUANTITATIVE ANALYSIS OF THE STERKFONTEIN FOSSIL CERCOPITHECOIDEA POSTCRANIA

Table B54. Measurements derived from *Parapapio* humeri

| SPECIMEN NO | SWP 504 | SWP 959 | SWP 962 | SWP1137 | SWP 1165 | SWP 1211 | SWP 1262 | SWP 1287 | SWP 1540 | SWP 4006 | SWP 4047 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | **D13** | **D13** | | **U57** | **?** | **?** | **U52** | **?** | **?** | | |
| **LEVEL** | | | | **10'5"-11'5"** | **?** | **?** | **12' 3" - 13' 3"** | | **?** | | |
| **Proximal medio-lateral dimension** | 27.93 | 32.92 | 27.88 | | | | ? | | | | |
| **Humeral head diameter.** | 15.86 | 15.01 | 17.35 | | | | | | | | |
| **Anterior-posterior length of humeral head** | 17.69 | 19.26 | 20.94 | | | | | | | | |
| **Bio-epicondylar breadth** | 0 | | 0 | | 28.61 | 28.39 | 27.09 | 35.36 | 28 | 33.04 | 31.32 |
| **Greater tuberosity diameter** | 17.73 | 20.68 | 16.39 | 29.31 | ? | ? | ? | ? | ? | | ? |
| **Medial trochlear flange length** | 0 | | | 16.89 | 14.27 | 10.27 | 15.15 | 19.27 | 16.22 | 17.57 | 19.34 |
| **Lateral epicondyle to medial edge of trochlea** | 0 | | | | 25.6 | 26.4 | 25.2 | 33.24 | 26.87 | 27.32 | 26.24 |
| **Distal articular breadth** | 0 | | | 22.35 | 18.52 | 18.54 | 18.74 | 24.55 | 22.3 | 23.11 | 22.24 |
| **Proximal distal height of capitulum** | 0 | | 0 | 12.76 | 12.38 | 12.82 | ? | 15.79 | 14.86 | 13.03 | 12.76 |
| **Maximum medio-lateral length of olecranon fossa** | | | 0 | 12.86 | 11.23 | 12.56 | | 15.79 | 13.39 | 13.2 | 12.69 |
| **Maximum proximo-distal length of olecranon fossa** | | | | 8.86 | 7.02 | 10.02 | | 10.89 | 11.51 | 11.62 | 8.71 |
| **Angle of medial epicondyle relative to** | | | 0 | 32 | 36 | 36 | | 38 | 46 | 40 | 25 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **axis of distal articular surface** | | | | | | | | | | | |
| **Medial epicondyle projection** | | | | 31 | 20.5 | 41 | 16.97 | 27 | 14 | 27 | 26 |

Table B55. Measurements derived from *Parapapio* radii

| **SPECIMEN NO** | **SWP 515** | **SWP 798** | **SWP 802** | **SWP 1139** | **SWP 1204** | **SWP 1219** |
|---|---|---|---|---|---|---|
| **SPQUARE** | **D15** | **D18** | **D13** | | | **V47** |
| **LEVEL** | | | | | | 7' 10" - 8' 10" |
| **Maximum diameter of radial head** | 17.73 | 14.26 | 17.19 | | 14.28 | 16.13 |
| **Perpendicular breadth of radial head** | 15.4 | | | | 12.74 | 15.24 |
| **Proximo distal height of radial neck** | 11.14 | 6 | 8.58 | 4.72 | 6.64 | 9.57 |
| **Proximo distal height of radial neck and head** | 17.65 | 11.75 | 15.59 | | 11.81 | 16.19 |

Table B56. Measurements derived from *Parapapio* femora

| **Specimen no** | **SWP 1300 (L)** |
|---|---|
| **Square** | **V62** |
| **Level** | **8'5"-9'5"** |
| **Anterior-Posterior head diameter** | 18.99 |
| **Medio-lateral breadth of femur head** | 16.89 |
| **Greater trochanter projection/height** | 8.32 |
| **Neck diameter** | 18.15 |
| **Femoral length** | |
| **Neck-shaft angle** | 101 |
| **Medial condyle width** | |
| **Lateral condyle width** | |
| **Lesser trochanter shape and direction** | |

Table B57a and b. Measurements derived from *Papio* humeri

| **SPECIMEN NO** | **BP1/C 541** | **BP/3/23389** | **BP/3/24000** | **BP/3/31691** | **SWP 511** | **SWP 911** | **SWP 960** | **SWP967** |
|---|---|---|---|---|---|---|---|---|
| **SPQUARE** | | **JAC** | **N46** | **JAC** | **D13** | **D13** | **D13** | **D13** |
| **LEVEL** | | | **17'5"-18'0"** | **Pp** | | | | |
| Length(maximum dist from the most proximal point on the head to the most distal point) | 210 | | | | 0 | 0 | | 0 |
| Proximal medio-lateral dimension | 27.1 | | | | 0 | 0 | | 21.03 |
| Bio-epicondylar Breadth | 33.2 | | 28.1 | | 33.4 | 0 | | 0 |
| Greater tuberosity diameter | 19.8 | | | 24.5 | 0 | 0 | 21.74 | 0 |
| Medial trochlear flange length | 16.9 | 13.6 | | | 16.95 | 0 | | 0 |
| Lateral epicondyle to medial edge of trochlea | 30 | | | 13 | 31.69 | 0 | | 0 |
| Distal articular breadth | 23.4 | 20.1 | | 20.37 | 23.08 | 0 | | 0 |
| Fossa above capitulum | NO | | no | 15.34 | no | 0 | | 0 |
| Proximal distal height of capitulum | 14.4 | 12.6 | 12.1 | 10.5 | 13.71 | 13.07 | deep | 0 |
| Humeral head diameter. | 18 | | | | | | | 8.73 |
| Anterior-posterior length of humeral head | 24.8 | | | | | | 23.62 | |
| Maximum medio-lateral length of olecranon fossa | 15 | 12.5 | 14.5 | | 13.39 | 15.5 | | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Maximum proximo-distal length of olecranon fossa | 9.8 | 9.4 | 9.5 | 11.9 | 7.65 | 9.3 | | 0 |
| Projection of greater tuberosity above the head | well above | | | 10.05 | | 0 | slightly above | slightly above |
| Angle of medial epicondyle relative to axis of distal articular surface | 40 | 38 | 9 | | 17 | 0 | | 0 |

| **SPECIMEN NO** | **SWP1137** | **SWP 1176** | **SWP 1201** | **SWP 1276** | **SWP 1406** | **SWP 1584** | **SWP 2810** | **SWP 4246** |
|---|---|---|---|---|---|---|---|---|
| **SPQUARE** | **U57** | **W46** | **W57** | **M4** | **D20** | **D20** | **D18** | **W57** |
| **LEVEL** | **10'5"-11'5"** | **3'11"-4'11"** | **9'2"-10'2"** | | | | | **7'5"-8'5"** |
| Proximal medio-lateral dimension | | | 23.59 | 27.56 | | | | 0 |
| Bio-epicondylar Breadth | 29.31 | 35.81 | 0 | | | 31.44 | 28.3 | 28.14 |
| Greater tuberosity diameter | 0 | 0 | | 16.4 | | | | 0 |
| Medial trochlea flange length | 16.89 | 18.5 | | | | 16.3 | | 19.03 |
| Lateral epicondyle to medial edge of trochlea | 22.35 | 25,64 | | | | 29.96 | 25.4 | 23.41 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Distal articular breadth | 25.08 | 20.28 | | | | | 17.7 | 20.04 |
| Fossa above capitulum | depression | 0 | | | | depression | NO | no |
| Proximal distal height of capitulum | 12.76 | 10.87 | | | | | 12.8 | 0 |
| Shaft curvature (weak or marked) | weak | | | | | | | weak |
| Humeral head diameter. | | | 12.08 | | 15.77 | | | |
| Anterior-posterior length of humeral head | | | 18.7 | 20.27 | 25.33 | | | |
| Maximum medio-lateral length of olecranon fossa | 12.86 | 10.02 | | | | 14.8 | 11.6 | 13.04 |
| Maximum proximo-distal length of olecranon fossa | 8.86 | 4.41 | | | | 9.77 | 8 | 9.21 |
| Projection of greater tuberosity above the head | 0 | 0 | well above | above | well above | | | 0 |
| Angle of medial epicondyle relative to axis of distal articular surface | 32 | 33 | | | | 31 | | 41 |

Table B58. Measurements derived from *Papio* radii

| SPECIMEN NO | BPI/C 541 | SWP 514 | SWP 517 | SWP 791 | SWP 793 | SWP 803 | SWP 1418 | SWP 1552 |
|---|---|---|---|---|---|---|---|---|
| SPQUARE | | D13 | D13 | D18 | | D13 | D20 | D20 |
| **Maximum diameter of radial head** | 16 | 15.81 | 14.68 | 13.3 | 18.06 | 16.01 | 15.5 | 17.73 |
| **Perpendicular breadth of radial head** | 14.9 | 13.97 | 13.88 | | 14.12 | 13.55 | 15.29 | 15.87 |
| **Proximo distal height of radial neck** | 4.9 | 6.83 | 6.72 | 5.4 | 6.26 | 8.65 | 7.16 | 9.74 |
| **Proximo distal height of radial neck and head** | 12 | 10.58 | 13.87 | 10.31 | 12.74 | 14.61 | 11.8 | 16.15 |

Table B59. Measurements derived from *Papio* ulnae

| **SPECIMEN NO** | **BP/3/23257** | **SWP 814** | **SWP 824** | **SWP 1155** | **SWP 1572** | **SWP 1577** |
|---|---|---|---|---|---|---|
| **SPQUARE** | JAC | **D13** | **D13** | | D18 | **D18** |
| Antero-posterior length of olecranon process | 26.50 | 19 | 23.14 | | 23.39 | 17.01 |
| Proximo distal height of olecranon process | 12.8 | 6.81 | 8.74 | | 10.02 | 7.07 |
| Medio-lateral breadth of olecranon process | 10.5 | 10.55 | 9.11 | | 11.71 | 9.75 |
| Proximo distal height of trochlear notch | 17.2 | 13.66 | 14.69 | | 15.86 | 13.84 |

Table B60a. Measurements derived from *Papio/Parapapio* humeri

| **SPECIMEN NO** | **BP/3/23016** | **BP/3/23389** | **SWP 441** | **SWP 4038** | **SWP 1584** | **SWP 1199** | **SWP 1582** | **SWP 1542** | **sts 154** |
|---|---|---|---|---|---|---|---|---|---|
| **SPQUARE** | | **JAC** | **N45** | **V37** | **D2** | **V57** | **D2** | **D2** | |
| **LEVEL** | **12’ 6”- 13’ 1”** | | **31' 0" - 32' 0"** | **5' 0" 6'9"** | | **10'3"-11'0"** | | | |
| Proximal medio-lateral dimension | | | | | | 22.35 | | | |
| Bio-epicondylar Breadth | | | 28.36 | 28.6 | 31.44 | 17.45 | | | |
| Greater tuberosity diameter | | | | | | 15.57 | | | |
| Medial trochlear flange length | 14.1 | 13.6 | 15.32 | 13.7 | 16.3 | | | | 17 |
| Lateral epicondyle to medial edge of trochlea | 27.1 | | 27.92 | 21.46 | 29.96 | | 29.94 | | |
| Distal articular breadth | 19.3 | 20.1 | 22..55 | 15.58 | | | 22.8 | | 22 |
| Fossa above capitulum | yes | | no | no | | | | | |
| Proximal distal height of capitulum | 12 | 12.6 | 12.13 | 12.09 | | | 13.34 | | 1 |
| Anterior-posterior length of humeral head | | | | | | 14.95 | | | |
| Maximum medio-lateral length of olecranon fossa | | 12.5 | 12.63 | | 14.8 | | 12.77 | | |
| Maximum proximo-distal length of olecranon fossa | | 9.4 | 13.36 | | 9.77 | | | | |
| Angle of medial epicondyle relative to axis of distal articular surface | 38 | 38 | 28 | 28 | 31 | | | | 1 |

Table B60b. Measurements derived from *Papio/Parapapio* humeri

| **SPECIMEN NO** | **BP/3/23016** | **SWP 4041** | **SWP 1199** | **SWP 1582** | **SWP 1542** | **SWP 1410** | **SWP 562** | **STS 377C** | **SWP 507** |
|---|---|---|---|---|---|---|---|---|---|
| **SPQUARE** | | **N45** | **V57** | **D20** | **D20** | **D20** | **D14** | | **D13** |
| **LEVEL** | **12’ 6”- 13’ 1”** | **31' 0" - 32' 0"** | **10'3"- 11'0"** | | | | | | |
| | | | | | | | | | |
| Length(maximum dist from the most proximal point on the head to the most distal point) | | | | | | | | | |
| Proximal medio-lateral dimension | | | 22.35 | | | | | | |
| Bio-epicondylar Breadth | | 28.36 | | | | 27.57 | 30.26 | 27 | 27.71 |
| Greater tuberosity diameter | | | 15.57 | | | | | | |
| Medial trochlear flange length | 14.1 | 15.32 | | | | 13.9 | 18.31 | 14 | 12.29 |
| Lateral epicondyle to medial edge of trochlea | 27.1 | 27.92 | | 29.94 | | 24.03 | 29.01 | 25 | 25.07 |
| Distal articular breadth | 19.3 | 22..55 | | 22.8 | | 19 | 26.74 | 15 | 18.74 |
| Fossa above capitulum | yes | no | | | | | | | no |
| Proximal distal height of capitulum | 12 | 12.13 | | 13.34 | | 12.03 | 11.9 | 9.9 | 8.92 |
| Depth of bicipital groove | | | deep | | | | | | |
| Humeral head diameter. | | | 10 | | | | | | |
| Anterior-posterior length of humeral head | | | 14.95 | | | | | | |
| Maximum medio-lateral length of olecranon fossa | | 12.63 | | 12.77 | | 1.7 | 11.5 | 14 | 10.6 |
| Maximum proximo-distal length of olecranon fossa | | 13.36 | | | | 11.91 | 12.26 | 11 | 10.6 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Angle of medial epicondyle relative to axis of distal articular surface | 38 | 28 | | | | 35 | 27 | 25 | 45 |

Table B60c. Measurements derived from *Papio/Parapapio* humeri

| **SPECIMEN NO** | **SWP 1140** | **SWP 1141** | **SWP 995** | **SWP 912** | **SWP 1016** | BP/3/18382 | **sts 1504** | **SWP 4038** |
|---|---|---|---|---|---|---|---|---|
| **SPQUARE** | **W46** | | **D14** | **D13** | **D8** | S54 | | |
| **LEVEL** | **3'11"-4'11"** | | | | | | | |
| Proximal medio-lateral dimension | | | | | | | | |
| Bio-epicondylar Breadth | 35.81 | | | 26.77 | 29.82 | 26 | | 28.6 |
| Greater tuberosity diameter | | | | | | | | |
| Medial trochlear flange length | 18.5 | | | 11.33 | 19.78 | | 17 | 13.07 |
| Lateral epicondyle to medial edge of trochlea | 33.64 | | | 22.25 | 29.65 | 23 | | 21.46 |
| Distal articular breadth | 20.28 | | | 18.67 | 18.57 | 20.5 | 22 | 15.58 |
| Proximal distal height of capitulum | 10.87 | | 7.07 | 11.15 | 15.12 | 10.6 | 10 | 12.09 |
| Shaft curvature (weak or marked) | | | weak | | | | | |
| Maximum medio-lateral length of olecranon fossa | 10.02 | | 8.01 | 10.71 | 12.87 | 10.5 | | |
| Maximum proximo-distal length of olecranon fossa | 4.41 | | 8.01 | 8.47 | 10.12 | 10.5 | | |
| Angle of medial epicondyle relative to axis of distal articular surface | 33 | | 18 | 19 | 40 | | | 28 |

Table B61a and b. Measurements derived from *Papio/Parapapio* ulna

| **SPECIMEN NO** | **BP/3/23336** | **SWP 1569** | **SWP 524** | **SWP 853** | **SWP 1568** | **SWP 1570** | **SWP 1571** |
|---|---|---|---|---|---|---|---|
| **SQUARE** | **JAC** | **D18** | **D13** | **D13** | **D18** | **D18** | **D18** |
| Antero-posterior length of olecranon process | | | | 19.46 | | 18.34 | |
| Proximo distal height of olecranon process | | | 8.35 | 9.31 | | 8.94 | 3.98 |
| Medio-lateral breadth of olecranon process | 10 | | 10.44 | 10.06 | 10.12 | 7.16 | 8.69 |
| Proximo distal height of trochlear notch | | 15.83 | 14.73 | 13.68 | 11.37 | 12.91 | 12.87 |

| **SPECIMEN NO** | **SWP 1576** | **SWP1580** | **SWP 1590** | **BP/3/31175** | **SWP 4008** | **SWP 4084** | **SWP 4015** |
|---|---|---|---|---|---|---|---|
| **SQUARE** | **D18** | **D18** | **D20** | **Jacovec Cavern** | **N45** | **W37** | **N45** |
| **LEVEL** | | | | | 31' 0" - 32' 0" | 4' 5" - 5' 2" | 29' 1" - 30' 1" |
| Antero-posterior length of olecranon process | | | 23.97 | | | 24.51 | 24.08 |
| Proximo distal height of olecranon process | | 5.86 | | | | 10.17 | 8.04 |
| Medio-lateral breadth of olecranon process | | 9.16 | 11.94 | 11.78 | 10.9 | 11.06 | 10.46 |
| Proximo distal height of trochlear notch | 14.43 | 12.99 | 15.65 | 17.25 | 12.35 | 20.36 | 16.93 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Anterior posterior length of distal end | | | | | | | |
| Medio-lateral breadth of distal end | | | | | | | |
| Proximo distal height of styloid process | | | | | | | |

Table B21. Measurements derived from *Papio/Parapapio* radiI

| **SPECIMEN NO** | **SWP 518** | **SWP 1368** | **SWP 1519** | **SWP 255** | **SWP 506** |
|---|---|---|---|---|---|
| **SQUARE** | **D13** | **D20** | **D18** | **D13** | **D18** |
| Maximum diameter of radial head | 15.61 | | | 17.08 | 14.74 |
| Perpendicular breadth of radial head | 14.6 | | | 15.31 | 13.15 |
| Proximo distal height of radial neck | | | 8.16 | | |
| Proximo distal height of radial neck and head | | | 10.22 | | |

Table B63a. Measurements derived from *Papio/Parapapio* femora

| SPECIMEN NO | SWP 1700 | SWP526 | SWP 746 | SWP 1085 | SWP 1171 | SWP 1203 |
|---|---|---|---|---|---|---|
| **SQUARE** | | **D13** | **D13** | **D20** | **V47** | |
| **LEVEL** | | | | | **5'10"-6'10"** | |
| **Anterior-Posterior head diameter** | | 18.62 | | 19 | | 18.16 |
| **Medio-lateral breadth of femur head** | | 16.55 | | 17.18 | | 16.54 |
| **Greater trochanter projection/height** | 8.35 | | | 8.52 | | |
| **Neck diameter** | 15.11 | 7.07 | | 5.96 | | 14.33 |
| **Neck-shaft angle** | 115 | 108 | | 120 | | 104 |
| **Medial condyle width** | | | | | | |
| **Lateral condyle width** | 11 | | | | | |

Table B63b. Measurements derived from *Papio/Parapapio* femora

| SPECIMEN NO | SWP 1263 | SWP 531 | SWP 1532 ® | SWP 533 | SWP 1008 | SWP 1206 | SWP 1698 | SWP 4103 | SF5496 |
|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | | **D13** | **D20** | **D13** | **D14** | **T35** | | **V37** | |
| **LEVEL** | | | | | | **8'6"-9'5"** | | **5' 0" - 6' 9:** | |
| **Anterior-Posterior head diameter** | 18.73 | 18 | | 18.57 | 17.53 | 18.04 | | 18.93 | 16.1 |
| **Medio-lateral breadth of femur head** | 13.82 | 17.77 | | 16.42 | 14.97 | | 15.18 | 16.27 | 14.9 |
| **Greater trochanter projection/height** | | | | | | | 8.8 | | 9 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Neck diameter** | 16.99 | 15.52 | | 17.53 | 13.87 | | 14.44 | 17.01 | 11.8 |
| **Bi-epicondylar breadth/width** | | | 34.83 | | | | | | |
| **Patella surface rim height** | | | 22.45 | | | | | | |
| **Position and shape of fovea capitus** | posterior oval | distal and oval | | anterior rounded | Posterior oval | Posterior, oval | oval | oval elongated | |
| **Femoral length** | | | | | | | | | |
| **Neck-shaft angle** | 114 | 125 | | 118 | | | | 110 | |
| **Medial condyle width** | | | 11.65 | | | | | | |
| **Lateral condyle width** | | | 14.23 | | | | | | |
| **Lesser trochanter shape and direction** | medially | medial | | medial | | | | | L |

Table B64. Measurements derived from *Theropithecus* ulnae

| **SPECIMEN NO** | **SWP 1148** | **SWP 1578** | **SWP 1604** | **SWP 4001** | **SWP 1104** | **SWP 1110** | **SWP 1156** | **SF 3418** | **SWP 4084** | **SWP 822** | **SWP 825** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | Q46 | D18 | D18 | d18 | T46 | Aa 48 | T49 | T45 | **W37** | D13 | D13 |
| **LEVEL** | 8'8"-9'8" | | | | 9'10 - 10'10" | 4' 1"- 5' 1" | 8'8"- 9'8" | 18' 6" - 19' 6" | **4' 5" - 5' 2"** | | |
| Antero-posterior length of olecranon process | | 20.26 | 27.32 | 28.03 | 25.92 | 25.88 | 18.23 | 25.45 | 24.51 | 19.37 | 15.91 |
| Proximo distal height of olecranon process | 8.3 | 10.38 | | 13.61 | 14.34 | 13.75 | 7.38 | 7.14 | 10.17 | 8.77 | 6.44 |
| Medio-lateral breadth of olecranon process | 11.37 | 10.2 | | 11.46 | 11.97 | 14.41 | 10.02 | 10.85 | 11.06 | 12.68 | 6.23 |
| Proximo distal height of trochlear notch | 16.82 | 15.34 | | 16.52 | 16.62 | 8.07 | 13.65 | 15.52 | 20.36 | 11.66 | 11.21 |

Table B65. Measurements derived from *Theropithecus* femur

| **SPECIMEN NO** | **SWP 1536** | **SWP 1697** | **SWP 4039** | SWP 528 | **SWP1537** |
|---|---|---|---|---|---|
| **SQUARE** | **D20** | **D20** | **N49** | **D13** | **D20** |
| **LEVEL** | | | **25' 3"- 26' 3** | | |
| Anterior-Posterior head diameter | | 19.23 | 19.19 | 18.86 | 22.27 |
| Medio-lateral breadth of femur head | | 16.94 | 17.43 | 18.8 | 21.28 |
| Greater trochanter projection/height | 10.33 | 12.3 | 13.06 | 12.14 | 11.1 |
| Neck diameter | | 16.69 | 16.8 | 16.93 | 19.17 |
| Neck-shaft angle | | 110 | 100 | 100 | 106 |

## Papionina

Table B66. Measurements derived from *Papionina* humerus

| **SPECIMEN NO** | **SWP 1539** | **SWP 1543** | **SWP 1581** | **SWP 4099** |
|---|---|---|---|---|
| **SPQUARE** | **D20** | **D20** | **D20** | **V37** |
| **LEVEL** | | | | **5' 0" - 6' 9"** |
| Medial trochlear flange length | | 15.11 | | |
| Proximal distal height of capitulum | 12.57 | 5.68 | 12.08 | 15.02 |
| Angle of medial epicondyle relative to axis of distal articular surface | | 21 | | |

Table B67. Measurements derived from *Papionina* humerus

| **SPECIMEN NO** | **SF 1465** | **SWP 816** | **SWP 817** | **SWP 179** | **SWP 1213** | **SWP 1285** | **SWP 1561** | **SWP 1567** | **SWP 1575** | **SWP 4015** |
|---|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | **Q42** | **D13** | | | **R65** | | **D20** | **D18** | | **N45** |
| **LEVEL** | **11' 2" -12' 10"** | | | | 10'8- 11'8" | | | | | **29' 1" - 30' 1"** |
| Antero-posterior length of olecranon process | | | 25.31 | | | 19.24 | 19.54 | | | 24.08 |
| Proximo distal height of olecranon process | | | 10.38 | | | 6.03 | | | | 8.04 |
| Medio-lateral breadth of olecranon process | 11.94 | 11.40 | 10.84 | 9.72 | | 11.28 | 10.80 | | | 10.46 |
| Proximo distal height of trochlear notch | 15.86 | | 17.00 | | 12.89 | 13.01 | 11.31 | 13.17 | 10.15 | 16.93 |

Table B68a. Measurements derived from *Papionina* radius

| **SPECIMEN NO** | **STS Unnumbered** | **SWP 255** | **SWP 506** | **SWP 516** | **SWP 519** | **SWP 520** | **SWP 1553** | **SWP 792** | **SWP 797** | **SWP 799** |
|---|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | | **D13** | **D18** | **D13** | **D18** | **D20** | **MYR 41** | **D3** | **D13** | |
| **LEVEL** | | | | | | | 8' 10" - 9' 10" | | | |
| **Maximum diameter of radial head** | 17 | 17.08 | 14.74 | 17.93 | 13.25 | 14.99 | 14.96 | 15.8 | 15.79 | 16.75 |
| **Perpendicular breadth of radial head** | 15 | 15.31 | 13.15 | 16.16 | 12.28 | 13.37 | | | | |
| **Proximo distal height of radial neck** | 9 | | | 8.62 | 7.76 | 6.93 | | 9.16 | | 5 |
| **Proximo distal height of radial neck and head** | 15 | | | 14.87 | 11.64 | 11.78 | | 15.04 | | 10.69 |

Table B68b. Measurements derived from *Papionina* radius continued

| SPECIMEN NO | SWP 806 | SWP 808 | SWP 972 | SWP 979 | SWP 1125 | SWP 1139 | SWP 1198 | SWP 1306 | SWP 1416 | SWP 4059 | SWP 4063 | SWP 4087 | SF 2689 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | **D13** | **D13** | **D13** | **D13** | **O45** | | **V57** | **W59** | **D20** | **p49** | **P 45** | **W37** | **S46** |
| **LEVEL** | | | | | **13' 3"- 13' 11"** | | | | | **28' 0" – 29' 0** | **32' 1" - 33' 1"** | **4' 5" - 5' 2"** | 22' 7" - 23' 7" |
| **Maximum diameter of radial head** | | 16.38 | 17.14 | 15.06 | 16.42 | | | 18.02 | 19.52 | 13.62 | | | |
| **Perpendicular breadth of radial head** | | | 15.58 | 13.35 | | | | | | 12.88 | | | |
| **Proximo distal height of radial neck** | 9.44 | 6.27 | 9.55 | 7.95 | 8.89 | 4.72 | 5.43 | 8.46 | 10.41 | | 5.05 | 7.19 | 5.06 |
| **Proximo distal height of radial neck and head** | 13.71 | 12.91 | 17.28 | 12.39 | 13.95 | | | 15.04 | 15.81 | | | 12.52 | |

Table B69. Measurements derived from *Papionina* femur

| **SPECIMEN NO** | **SWP 527** | **SWP 529** | **SWP530** | **SWP 1384** | **SWP 1532** | **SWP 1534** | **SWP 1699** | **SWP 1704** | **SWP 4035** |
|---|---|---|---|---|---|---|---|---|---|
| **SQUARE** | **D13** | **D14** | **D13** | **D20** | **D20** | **D20** | **D20** | **D20** | **W37** |
| **LEVEL** | | | | **R** | | | | | **4' 5" - 5' 2"** |
| Anterior-posterior head diameter | | 19.43 | | 17.3 | | | 17.49 | 16.41 | 18.31 |
| Medio-lateral breadth of femur head | 13.43 | 14.79 | 17.93 | 12.22 | | | 16.18 | 13.54 | 17.68 |
| Greater trochanter projection/height | | | | | | | | 7.73 | |
| Neck diameter | 15 | 15.39 | 17.21 | | | | 17 | 13.49 | 13.33 |
| Bi-epicondylar breadth/width | | | | | 34.83 | 36.9 | | | |
| Patella surface rim height | | | | | 22.45 | 27.5 | | | |
| Neck-shaft angle | 120 | | | | | | | | 112 |
| Medial condyle width | | | | | 11.65 | | | | |
| Lateral condyle width | | | | | 14.23 | 13 | | | |

## *Cercopithecus* sp

Table B70. Measurements derived from *Cercopithecus* sp radius

| **SPECIMEN NO** | **BPI/C 294** | **SWP 4012** |
|---|---|---|
| **SQUARE** | | **X36** |
| **LEVEL** | | **3' 2" - 4' 9"** |
| Maximum diameter of radial head | 10 | 13.99 |
| Perpendicular breadth of radial head | 9 | 9.35 |
| Proximo distal height of radial neck | 8.5 | 4.21 |
| Proximo distal height of radial neck and head | 13 | 8.11 |

## ***Cercopithecoides* sp**

Table B71. Measurements derived from *Cercopithecoides femur*

| **SPECIMEN NO** | **SWP 883** |
|---|---|
| **SQUARE** | **D13** |
| Anterior-Posterior head diameter | 18 |
| Medio-lateral breadth of femur head | 15.63 |
| Greater trochanter projection/height | |
| Neck diameter | 8.61 |

# APPENDIX C

## TABLES

Table C1 Fossil cercopithecoid taxa identified in the Sterkfontein deposits based on post crania.

| Taxa | Jacovec | Silberberg | M4 | StW53 | Oldowan | M5West | M6 |
|---|---|---|---|---|---|---|---|
| *Papio* | x | x | x | x | x | | x |
| *Parapapio* | | x | x | x | | x | |
| *Papio/Parapapio* | x | x | x | x | x | | |
| *cf. Theropithecus* | | | x | x | | | |
| *Cercopithecus sp* | | x | x | | | | x |
| *Cercopithecus aethiops* | | | x | | | | x |
| *Cercopithecoides* | | | x | | | | |
| *Colobinae indet* | | | x | x | | | |
| *Colobus sp* | | | | | | | |

TABLES C2-C18. Sterkfontein caves skeletal element frequencies, NISP/MNE/cMNI.

Legend

| | |
|---|---|
| cMNI | cumulative Minimum Number of Individuals |
| M | Medium |
| MNE | Mininum Number of Elements |
| NISP | Number of Identified Specimens |
| S | Small |
| Vert | Vertebrae |

Table C2. Sterkfontein Caves combined skeletal frequencies, NISP

| Element | NISP |
|---|---|
| Humerus | **228** |
| Ulna | **181** |
| Radius | **167** |
| Femur | **349** |
| Tibia | **98** |
| Fibula | **18** |
| Rib | **35** |
| Vert | **71** |
| Scapula | **24** |
| Pelvis | **66** |
| Patella | **11** |
| Sternum | **5** |
| Clavicle | **10** |
| Metacarpal | **17** |
| Metatarsal | **41** |
| Metapodial | **22** |
| Phalanges | **20** |
| Talus | **39** |
| Calcaneus | **79** |
| Carpals | **2** |
| Tarsals | **13** |
| Long bones | **34** |
| **Total** | **1510** |

Table C3. Jacovec Cavern skeletal frequencies, current study.

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 14 | 10 | 9 |
| Ulna | 16 | 9 | 5 |
| Radius | 22 | 17 | 10 |
| Femur | 14 | 11 | 8 |
| Tibia | 8 | 7 | 4 |
| Fibula | 8 | 7 | 4 |
| Rib | 4 | 3 | 2 |
| Vert | 10 | 10 | 4 |
| Scapula | 5 | 5 | 3 |
| Pelvis | 5 | 5 | 3 |
| Patella | 3 | 3 | 2 |
| Sternum | 2 | 1 | 1 |
| Clavicle | 7 | 6 | 3 |
| Metacarpal | 9 | 9 | 4 |
| Metatarsal | 14 | 14 | 5 |
| Metapodial | 7 | 6 | 3 |
| Phalanges | 24 | 24 | 3 |
| Talus | 2 | 2 | 2 |
| Calcaneus | 2 | 2 | 2 |
| Carpals | | | |
| Tarsals | 6 | 6 | 3 |

Table C4. Jacovec Cavern skeletal frequencies (after Kibii 2004).

| Element | NISP (M/S) | MNE (M/S)E | cMNI (M/S) |
|---|---|---|---|
| Humerus | 3/6 | 2/4 | 1/3 |
| Ulna | 11/3 | 8/2 | 4/1 |
| Radius | 10/7 | 6/5 | 4/3 |
| Femur | 7/5 | 5/5 | 3/3 |
| Tibia | 3/4 | 3/3 | 2/2 |
| Fibula | 0/4 | 0/2 | 0/1 |
| Rib | 0 | 0 | 0 |
| Vert | 0/5 | 0/5 | 0/1 |
| Scapula | 1/3 | 1/3 | ½ |
| Pelvis | 1/1 | 1/1 | 1/1 |
| Patella | 2/1 | 2/1 | 1/1 |
| Sternum | 0 | 0 | 0 |
| Clavicle | /3 | /3 | /2 |
| Metacarpal | 4/5 | 4/5 | 1/3 |
| Metatarsal | 11/1 | 11/1 | 4/1 |
| Metapodial | | | |
| Phalanges | 9/14 | 9/13 | 1/1 |
| Talus | /2 | /2 | /1 |
| Calcaneus | 1/1 | 1/1 | 1/1 |
| Carpals | | | |
| Tarsals | 4/2 | 4/2 | 2/1 |

Table C5. Silberberg Grotto skeletal frequencies, current study

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 23 | 19 | 12 |
| Ulna | 18 | 12 | 8 |
| Radius | 10 | 9 | 7 |
| Femur | 55 | 28 | 13 |
| Tibia | 10 | 4 | 4 |
| Fibula | 0 | 0 | 0 |
| Rib | 0 | 0 | 0 |
| Vert | 0 | 0 | 0 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 9 | 7 | 4 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 0 | 0 | 0 |
| Metapodial | 3 | 2 | 2 |
| Phalanges | 3 | 3 | 2 |
| Talus | 3 | 3 | 2 |
| Calcaneus | 3 | 3 | 1 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 0 | 0 | 0 |

Table C6. Member 2 Main excavation skeletal frequencies by Pickering *et al.* (2004)

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 8 | 7 | 6 |
| Ulna | 1 | 1 | 1 |
| Radius | 1 | 1 | 1 |
| Femur | 9 | 6 | 4 |
| Tibia | 7 | 4 | 3 |
| Fibula | 0 | 0 | 0 |
| Rib | 3 | 3 | 1 |
| Vert | 7 | 7 | 2 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 8 | 7 | 4 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 1 | 1 | 1 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 3 | 3 | 1 |
| Metapodial | 0 | 0 | 0 |
| Phalanges | 0 | 0 | 0 |
| Talus | 0 | 0 | 0 |
| Calcaneus | 5 | 5 | 1 |
| Carpals | | | |
| Tarsals | 5 | 5 | 5 |

Table C7. Member 4 deposit skeletal frequencies, current study.

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 173 | 86 | 46 |
| Ulna | 131 | 82 | 45 |
| Radius | 128 | 74 | 40 |
| Femur | 274 | 89 | 52 |
| Long bone | 34 | | |
| Tibia | 64 | 42 | 26 |
| Fibula | 9 | 6 | 4 |
| Rib | 4 | 4 | 1 |
| Vert | 25 | 22 | 3 |
| Scapula | 16 | 11 | 9 |
| Pelvis | 49 | 26 | 17 |
| Patella | 7 | 7 | 4 |
| Sternum | 1 | 1 | 1 |
| Clavicle | 3 | 3 | 3 |
| Metacarpal | 2 | 2 | 1 |
| Metatarsal | 24 | 23 | 5 |
| Metapodial | 10 | 8 | 2 |
| Phalanges | 10 | 10 | 7 |
| Talus | 21 | 21 | 14 |
| Calcaneus | 19 | 18 | 2 |
| Carpals | 4 | 4 | 2 |
| Tarsals | 5 | 5 | 2 |

Table C8. Member 4 deposit skeletal frequencies by Kibii (2004).

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 14 | 8 | 7 |
| Ulna | 18 | 11 | 7 |
| Radius | 7 | 6 | 5 |
| Femur | 14 | 10 | 6 |
| Long bone | ? | ? | ? |
| Tibia | 10 | 8 | 6 |
| Fibula | 2 | 2 | 2 |
| Rib | 0 | 0 | 0 |
| Vert | 11 | 11 | 9 |
| Scapula | 8 | 8 | 7 |
| Pelvis | 22 | 19 | 14 |
| Patella | 2 | 2 | 1 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 7 | 7 | 4 |
| Metatarsal | 8 | 8 | 6 |
| Metapodial | 0 | 0 | *0* |
| Talus | 5 | 5 | 4 |
| Calcaneus | 4 | 4 | 4 |
| Phalanges | 11 | 11 | 3 |
| Carpals | | | |
| Tarsals | 2 | 2 | 2 |

Table C9. StW 53 Infill skeletal frequencies, current study

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 5 | 3 | 2 |
| Ulna | 4 | 3 | 2 |
| Radius | 5 | 5 | 4 |
| Femur | 1 | 1 | 1 |
| Tibia | 6 | 4 | 3 |
| Fibula | 0 | 0 | 0 |
| Rib | 4 | 2 | 1 |
| Vert | 4 | 3 | 1 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 0 | 0 | 0 |
| Patella | 1 | 1 | 1 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 1 | 1 | 1 |
| Metapodial | 2 | 1 | 1 |
| Phalanges | 0 | 0 | 0 |
| Talus | 4 | 4 | 3 |
| Calcaneus | 2 | 2 | 1 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 0 | 0 | 0 |

Table C10. StW 53 infill skeletal frequencies by Pickering 1999

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 2 | 2 | 1 |
| Ulna | 2 | 1 | 1 |
| Radius | 0 | 0 | 0 |
| Femur | 0 | 0 | 0 |
| Tibia | 6 | 2 | 1 |
| Fibula | 0 | 0 | 0 |
| Rib | 0 | 0 | 0 |
| Vert | 3 | | |
| Scapula | 0 | 0 | 0 |
| Pelvis | 0 | 0 | 0 |
| Patella | 1 | 1 | 1 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 0 | 0 | 0 |
| Metapodial | 2 | 2 | 2 |
| Phalanges | 2 | 2 | 2 |
| Talus | 3 | 3 | 2 |
| Calcaneus | 0 | 0 | 0 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 1 | 1 | 1 |

Table C11. Oldowan Infill skeletal frequencies, current study.

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 6 | 4 | 3 |
| Ulna | 7 | 6 | 5 |
| Radius | 2 | 2 | 2 |
| Femur | 3 | 2 | 1 |
| Tibia | 4 | 3 | 2 |
| Fibula | 1 | 1 | 1 |
| Rib | 21 | 9 | 1 |
| Vert | 26 | 19 | 1 |
| Scapula | 1 | 1 | 1 |
| Pelvis | 1 | 1 | 1 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 6 | 6 | 3 |
| Metatarsal | 2 | 2 | 2 |
| Metapodial | 0 | 0 | 0 |
| Phalanges | 2 | 2 | 2 |
| Talus | 5 | 5 | 3 |
| Calcaneus | 7 | 7 | 1 |
| Carpals | 0 | | |
| Tarsals | 2 | 2 | 1 |

Table C12. Oldowan Infill skeletal frequencies by Pickering 1999

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 3 | 2 | 2 |
| Ulna | 6 | 6 | 5 |
| Radius | 3 | 3 | 2 |
| Femur | 2 | 2 | 2 |
| Tibia | 4 | 3 | 2 |
| Fibula | 1 | 1 | 1 |
| Rib | 22 | 10 | 1 |
| Vert | 26 | 19 | 1 |
| Scapula | 1 | 1 | 1 |
| Pelvis | 1 | 1 | 1 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 2 | 2 | 1 |
| Metapodial | 10 | 6 | 1 |
| Phalanges | 2 | 2 | 2 |
| Talus | 4 | 4 | 3 |
| Calcaneus | 0 | 0 | 0 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 1 | 1 | 1 |

Table C13. Member 5 West deposit skeletal frequencies, current study.

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 2 | 2 | 1 |
| Ulna | 1 | 1 | 1 |
| Radius | 0 | 0 | 0 |
| Femur | 2 | 1 | 1 |
| Tibia | 1 | 1 | 1 |
| Fibula | 0 | | |
| Rib | 2 | 1 | 1 |
| Vert | 4 | 4 | 1 |
| Scapula | 0 | | |
| Pelvis | 0 | | |
| Patella | 1 | 1 | 1 |
| Sternum | 0 | | |
| Clavicle | 0 | | |
| Metacarpal | 0 | | |
| Metatarsal | 0 | | |
| Metapodial | 0 | | |
| Phalanges | 2 | 2 | 2 |
| Talus | 2 | 2 | 2 |
| Calcaneus | 1 | 1 | 1 |
| Carpals | | | |
| Tarsals | | | |

Table C14. Member 5 West deposit skeletal frequencies by Pickering (1999).

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 0 | 0 | 0 |
| Ulna | 1 | 1 | 1 |
| Radius | | | |
| Femur | | | |
| Tibia | 1 | 1 | 1 |
| Fibula | | | |
| Rib | 2 | 1 | 1 |
| Vert | 1 | 1 | 1 |
| Scapula | | | |
| Pelvis | | | |
| Patella | | | |
| Sternum | | | |
| Clavicle | | | |
| Metacarpal | | | |
| Metatarsal | | | |
| Metapodial | | | |
| Phalanges | 1 | 1 | 1 |
| Talus | 2 | 2 | 2 |
| Calcaneus | | | |
| Carpals | | | |
| Tarsals | | | |

Table C15. Member 6 skeletal frequencies, current study

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 1 | 1 | 1 |
| Ulna | 0 | 0 | 0 |
| Radius | 0 | 0 | 0 |
| Femur | 0 | 0 | 0 |
| Tibia | 0 | 0 | 0 |
| Fibula | 0 | 0 | 0 |
| Rib | 0 | 0 | 0 |
| Vert | 0 | 0 | 0 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 0 | 0 | 0 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 0 | 0 | 0 |
| Metapodial | 0 | 0 | 0 |
| Phalanges | 1 | 1 | 1 |
| Talus | 0 | 0 | 0 |
| Calcaneus | 0 | 0 | 0 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 0 | 0 | 0 |

Table C16. Member 6 skeletal frequencies by Ogola (2009)

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 0 | 0 | 0 |
| Ulna | 0 | 0 | 0 |
| Radius | 0 | 0 | 0 |
| Femur | 0 | 0 | 0 |
| Tibia | 0 | 0 | 0 |
| Fibula | 0 | 0 | 0 |
| Rib | 0 | 0 | 0 |
| Vert | 0 | 0 | 0 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 0 | 0 | 0 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 0 | 0 | 0 |
| Metapodial | 0 | 0 | 0 |
| Phalanges | 1 | 1 | 1 |
| Talus | 0 | 0 | 0 |
| Calcaneus | 0 | 0 | 0 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 0 | 0 | 0 |

Table C17. Post Member 6 skeletal frequencies, current study

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 4 | 3 | 3 |
| Ulna | 5 | 4 | 4 |
| Radius | 0 | 0 | 0 |
| Femur | 0 | 0 | 0 |
| Tibia | 4 | 4 | 3 |
| Fibula | 0 | 0 | 0 |
| Rib | 0 | 0 | 0 |
| Vert | 2 | 2 | 1 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 1 | 1 | 1 |
| Patella | 0 | 0 | 0 |
| Sternum | 2 | 1 | 1 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 0 | 0 | 0 |
| Metapodial | 0 | 0 | 0 |
| Phalanges | 0 | 0 | 0 |
| Talus | 3 | 3 | 3 |
| Calcaneus | 1 | 1 | 1 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 0 | 0 | 0 |

Table C18. Post Member 6 skeletal frequencies, Ogola, 2009.

| Element | NISP | MNE | cMNI |
|---|---|---|---|
| Humerus | 2 | 2 | 2 |
| Ulna | 2 | 2 | 2 |
| Radius | 0 | 0 | 0 |
| Femur | 0 | 0 | 0 |
| Tibia | 3 | 3 | 3 |
| Fibula | 0 | 0 | 0 |
| Rib | 0 | 0 | 0 |
| Vert | 2 | 2 | 2 |
| Scapula | 0 | 0 | 0 |
| Pelvis | 1 | 1 | 1 |
| Patella | 0 | 0 | 0 |
| Sternum | 0 | 0 | 0 |
| Clavicle | 0 | 0 | 0 |
| Metacarpal | 0 | 0 | 0 |
| Metatarsal | 0 | 0 | 0 |
| Metapodial | 0 | 0 | 0 |
| Phalanges | 0 | 0 | 0 |
| Talus | 3 | 3 | 3 |
| Calcaneus | 0 | 0 | 0 |
| Carpals | 0 | 0 | 0 |
| Tarsals | 0 | 0 | 0 |

Table C19. Sterkfontein fossil cercopithecoid postcrania carnivore modification tooth pit dimensions

| | | **SF4217** | | **SF 1465** | **SWP 377d** | | | **SWP 526** | **SWP 531** | | | **SWP 756** | **SWP 896** | SWP 1351 | SWP 1416 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pit** | **Epiphysis** | | | | | | | | | | | | | | |
| | Length | 4.73 | 4.98 | 5.68 | | | | | | | 3.44 | | | | |
| | Breadth | 4.3 | 4.39 | 4.88 | | | | | | | 2.43 | | | | |
| | **Diaphysis** | | | | | | | | | | | | | | |
| | Length | | | | 2.9 | 2.1 | 5 | 3.74 | 2.95 | 3.42 | | | 8.46 | 5.9 | 7.25 |
| | Breadth | | | | 2.2 | 1.9 | 3.5 | 2.18 | 2.83 | 2.56 | | | 1.45 | 4.34 | 6.66 |
| | | | | | | | | | | | | | | | |
| **Score** | **Epiphysis** | | | | | | | | | | | | | | |
| | Length | 7.54 | | | | | | | | | | | | | |
| | Breadth | 4.77 | | | | | | | | | | | | | |
| | **Diaphysis** | | | | | | | | | | | | | | |
| | Length | | | | | | | | | | | 9.06 | | | |
| | Breadth | | | | | | | | | | | 5.67 | | | |
| | | | | | | | | | | | | | | | |

Table C19 continued.

| | | **SWP 1104** | | | **SWP 1119** | **SWP 1137** | | **SWP 1140** | | | **SWP 1206** | | **SWP 1263** | **SWP 1271** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pit** | **Epiphysis** | | | | | | | | | | | | | | |
| | Length | | | | 3.94 | 5.94 | 6.99 | 7.01 | 6.99 | 7.99 | 7.63 | 5.66 | 6.13 | 6.18 | 7.01 |
| | Breadth | | | | 2.2 | 4.99 | 4.02 | 5.02 | 5.02 | 5.01 | 5.66 | 1.66 | 4.86 | 5.09 | 4.98 |
| | **Diaphysis** | | | | | | | | | | | | | | |
| | Length | 7.76 | 4.51 | 5.34 | | | | | | | | | | | |
| | Breadth | 4.51 | 3.74 | 4.47 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| **Score** | **Epiphysis** | | | | | | | | | | | | | | |
| | Length | | | | | | | | | | | | | | |
| | Breadth | | | | | | | | | | | | | | |
| | **Diaphysis** | | | | | | | | | | | | | | |
| | Length | | | | | | | | | | | | | | |
| | Breadth | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Table C20. Sterkfontein fossil cercopithecoid postcrania tooth pit true population mean

| | **Epiphysis** | | **Diaphysis** | |
|---|---|---|---|---|
| **Statistics** | **Length** | **Breadth** | **Length** | **Breadth** |
| **mean** | 6.02 | 4.3 | 4.94 | 3.36 |
| **Standard deviation** | 1.320 | 1.212 | 2.064 | 1.477 |
| **95 % confidence interval** | ±0.67 | ±0.61 | ±1.17 | ±0.84 |
| **True population mean** | 5.35-6.69 | 3.69-4.91 | 3.77-6.11 | 2.52-4.2 |

Table C21. Ordinary Least Squares Regression: maximum medio-lateral width of olecranon fossa (HDTROW) and width distal humeral articulation (HDTRWA)

| | | | |
|---|---|---|---|
| Slope a: | 0.49362 | Std. error a: | 0.024689 |
| Intercept b: | 1.9193 | Std. error b: | 0.57779 |

95% bootstrapped confidence intervals (N=1999):
Slope a: (0.43933, 0.55081)
Intercept b: (0.60318, 3.1963)

Correlation:

| | |
|---|---|
| r: | 0.87531 |
| r2: | 0.76616 |
| t: | 19.993 |
| p (uncorr.): | 2.621E-40 |
| Permutation p: | 0.0001 |

Table C22. Ordinary Least Squares Regression: humeral head diameter/medio-lateral width (HHDWTR) and humeral head anterior-posterior length (HHDWAP).

| | | | |
|---|---|---|---|
| Slope a: | 0.77561 | Std. error a: | 0.041235 |
| Intercept b: | 4.7615 | Std. error b: | 1.0656 |

95% bootstrapped confidence intervals (N=1999):
Slope a: (0.71407, 0.84452)
Intercept b: (2.9419, 6.429)

Correlation:

| | |
|---|---|
| r: | 0.90309 |
| r2: | 0.81558 |
| t: | 18.809 |
| p (uncorr.): | 4.214E-31 |
| Permutation p: | 0.0001 |

Table C23. Ordinary Least Squares Regression: Maximum medio-lateral length of olecranon fossa-Maximum proximo-distal length of olecranon fossa

Slope a: 0.37746 Std. error a: 0.1271
Intercept b: 5.1001 Std. error b: 1.6041

95% bootstrapped confidence intervals (N=1999):
Slope a: (0.040741, 0.66999)
Intercept b: (1.2525, 9.6418)

Correlation:
r: 0.42944
r2: 0.18442
t: 2.9696
p (uncorr.): 0.0050795
Permutation p: 0.0059

Table C24. Ordinary Least Squares Regression: HDTRWA-HDTRWT

Slope a: 0.59901 Std. error a: 0.018844
Intercept b: -0.60208Std. error b: 0.44309

95% bootstrapped confidence intervals (N=1999):
Slope a: (0.55373, 0.6567)
Intercept b: (-2.0053, 0.46189)

Correlation:
r: 0.94922
r2: 0.90102
t: 31.788
p (uncorr.): 1.4204E-57
Permutation p: 0.0001

Table C25. Ordinary Least Squares Regression: HDTRWX-HDTRWA

Slope a: 0.74738 Std. error a: 0.02241
Intercept b: -2.35 Std. error b: 0.7259

95% bootstrapped confidence intervals (N=1999):
Slope a: (0.71724, 0.77882)
Intercept b: (-3.5043, -1.3251)

Correlation:
r: 0.95277
r2: 0.90777
t: 33.35
p (uncorr.): 2.5666E-60
Permutation p: 0.0001

Table C26. Ordinary Least Squares Regression: Antero-posterior length of olecranon process and proximo distal height of olecranon process

| | | | |
|---|---|---|---|
| Slope a: | -0.32169 | Std. error a: | 0.13669 |
| Intercept b: | 18.808 | Std. error b: | 2.6477 |

95% bootstrapped confidence intervals (N=1999):

| | |
|---|---|
| Slope a: | (-0.55955, -0.079748) |
| Intercept b: | (13.254, 24.371) |

Correlation:

| | |
|---|---|
| r: | -0.33437 |
| r2: | 0.1118 |
| t: | -2.3534 |
| p (uncorr.): | 0.023134 |
| Permutation p: | 0.0237 |

Table C27. Ordinary Least Squares Regression: Proximo-distal height of olecranon pocess and proximo-distal height of trochlea notch

| | | | |
|---|---|---|---|
| Slope a: | -0.0001224 | Std. error a: | 0.057614 |
| Intercept b: | 12.344 | Std. error b: | 1.7584 |

95% bootstrapped confidence intervals (N=1999):

| | |
|---|---|
| Slope a: | (-0.09163, 0.073469) |
| Intercept b: | (10.081, 14.418) |

Correlation:

| | |
|---|---|
| r: | -0.00030045 |
| r2: | 9.0271E-08 |
| t: | -0.0021245 |
| p (uncorr.): | 0.99831 |
| Permutation p: | 0.998 |

Table C28. Ordinary Least Squares Regression: Femur head anterior posterior length and femur medio-lateral width

Ordinary Least Squares Regression: FHEADAP-FHEADML

| | | | |
|---|---|---|---|
| Slope a: | 0.65642 | Std. error a: | 0.10077 |
| Intercept b: | 3.9572 | Std. error b: | 1.9649 |

95% bootstrapped confidence intervals (N=1999):

| | |
|---|---|
| Slope a: | (0.4153, 0.92826) |
| Intercept b: | (-1.0237, 8.7607) |

Correlation:
r: 0.62555
r2: 0.39132
t: 6.5139
p (uncorr.): 1.1743E-08
Permutation p: 0.0001