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NOTES ON THE SYSTEMATICS OF MICROMAMMALS FROM STERKFONTEIN, GAUTENG, SOUTH AFRICA

by

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ABSTRACT

The micromammalian fauna from Sterkfontein Members 4, 5E and 6 comprises 34 species. These include six insectivores, three bats, three elephant shrews and 22 rodents. Most of these taxa, or their equivalents, have been previously recorded. Four or five new additions were recovered from deposits probably belonging to Late Pleistocene Member 6, which have previously received little or no attention. Some previously recorded taxa were not found, but this was probably due to differences in identification rather than to the absence of these forms from the sample.

KEYWORDS: micromammals, Pleistocene, Sterkfontein, systematics

INTRODUCTION

Sterkfontein (26°01'S; 27°44'E) is one of the best known South African palaeoanthropological sites, having produced a wealth of hominid remains ascribed to at least three genera (Clarke 1994). The site has been excavated and described almost continuously since the first hominid specimen was published by Broom (1939). Initially, Member 5 collections were treated as contemporary, but Clarke (1994) and Kuman (1994, 1996) have shown that Member 5E includes earlier deposits containing Oldowan artefacts underlying deposits with Early Acheulean material. Their detailed work has further revealed that solution of the breccia in Member 5E led to mixing of material in the upper parts, particularly above 15 ft (4.6 m) but to a lesser extent down to 22 ft (6.7 m) (Kuman 1996). The site continues to be excavated in imperial measurements because the grid system was laid out in feet. In the present report the original measurements are given with metric equivalents in brackets. Current age estimates are: 2.8 to 2.6 my for Member 4; 2.0 to 1.7 my for the Oldowan deposits; about 1.5 my for the Early Acheulean sample; and >0.10 my for Member 6 (Clarke 1994, Clarke & Tobias 1995, Kuman pers. comm.) (Table 1).

Previous micromammalian samples, belonging to A.R. Hughes's pre-1969 collections from the Sterkfontein Type Site (STS), Dumps 1 & 2, Dump 8 and STW/H2, have been described by Pocock (1969, 1987). These were all considered to have come from Member 5, which is the second youngest of six members identified by Partridge (1978). Other material from the Type Site, which was described by De Graaff (1960), may have come from Member 4 (Brain 1981). Denys (1990) listed taxa found in a sample from the Sterkfontein Extension Site (SE), which lies within Member 5 West. The material reported here was collected by R.J. Clarke and K. Kuman since 1991 in Member 5 and comes mainly from Member 5 East. There are small samples from the adjacent Member 4 and from the Middle Stone Age (MSA), which is designated Member 6 (Tobias *et al.* 1993) and is a later infill that divides Member 5 East from Member 5 West. A final, possibly contaminated, sample derives from Member 5 West in the area previously excavated by Robinson (1962).

There is generally little difference in the micromammals from Sterkfontein and Swartkrans even though the former includes material that is both older and younger than that from Swartkrans, which has been discussed recently (Avery 1998). This paper is therefore confined to providing information on species not present at Swartkrans, and other supplementary remarks where appropriate. A separate study of the environmental implications of the Sterkfontein micromammalian fauna is in progress (Avery in prep.).

MATERIAL AND METHODS

Basic excavation units were 3 ft (0.9 m) square and generally 1 ft (0.3 m) deep. In the following discussion the material has been lumped into seven larger groups of units. Table 1 provides a general description of the grouped units and details of the assignments of individual units are available on request. Species represented are given in Table 2, together with the units in which they occur. Mandibles and maxillae were employed for identifications and computation of minimum numbers of individuals. Length and breadth of the lower first molar in *Steatomys* were measured (Figure 1) and unpaired *t*-tests were performed to determine whether more than one species was represented (Table 3). Percentage length of M_1 to M_2 in Sterkfontein *Mus* sp. was used as a basis for unpaired *t*-tests to compare the fossil material with modern *M. minutoides* and *M. musculus* (Table 4).

TABLE 1
Excavation units at Sterkfontein that yielded micromammalian material.

Member	Code*	Culture	Distribution+	Depth§	Comments	my B.P
6	M6	MSA	N59-60, Q58	18-28 ft (5.5-8.5 m)	Infill into M5	± 0.10
5	M5	ESA/MSA ?mixed	M63, N63-64,O64	12-16ft (3.7-4.9 m)	?decalcified deposit	
6/5	M6/5	ESA/MAS ?mixed	O59-61,O64/64, p59-61	13-13 ft (4.0-7.0 M)	possible mixing with M5	
5 East	M5E-A	Early Acheulean, ?mixed with MSA	O58, P53-54, P57-58, Q51-57, R50, R52-57, S52-57, T53-56	16-22 ft (4.9-6.7 m)	above 22 ft	± 1.5
5East	M5E-O	Oldowan	P53-54,P57-58, Q52-57, R52-57, S52-56, T55-56	22-34 ft (6.7-10.4 m)	Oldowan Infill below 22 ft	± 2.0-1.7
5East/4	M5E/4		Q49-52, R49, S51, T52-54	14-29 ft (4.3-8.8 m)	boundary between members	
4	M4		N46/O45/P45L, Q48-50, R49-51, S50	13-30 ft (4.0-9.1 m)		± 2.8-2.6

* Code: abbreviation used in other tables and figures
\+ Distribution: horizontal distribution of samples
§ Depth: vertical distribution of samples

SYSTEMATICS
Insectivora

Chrysochloridae
Amblysomus Pomel, 1848 (golden mole)

For the present all smaller specimens are assigned to *Amblysomus*, as they were at Swartkrans (Avery 1998). It is possible that two taxa are represented but Bronner (1996) has demonstrated that there can be considerable intra-populational variation within *Amblysomus*. In the Sterkfontein material, all specimens show an alveolus for M_3 although not all alveoli are the same size. The number of teeth is variable in modern chrysochlorids (Ellerman et al. 1953, Bronner 1996). This could be part of an evolutionary trend or it could be due to the unusual sequence of tooth replacement, as suggested by Bronner (1996). There is also variation in the extent to which talonids occur in the fossil material. However, the situation is not as clear as it is at Swartkrans, where there is generally a talonid on P_4 but not on M_1 (Avery 1998). Of the four examples of P_4, one each from M5E-A and M5 have talonids while another from M5E-A and one from M6 do not. One M_1, from M5E-A, has a slight talonid whereas the other, from M5E/M6, has none. It could be inferred that the earlier specimens represent a population in which this feature was in the process of disappearing and that by about

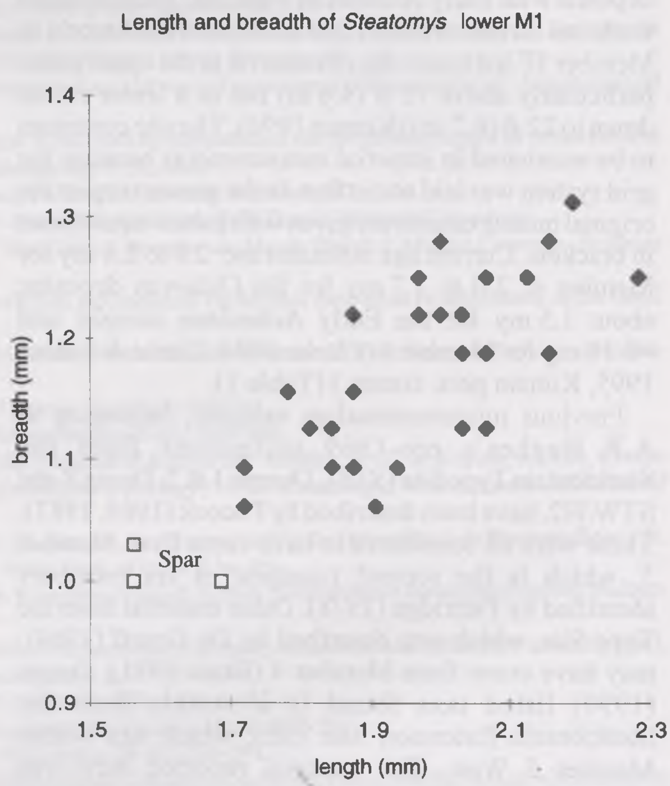

Figure 1. Variation in length and breadth of lower M1 in *Steatomys* from Sterkfontein. Spar — putative *Steatomys parvus*.

120 000 years ago the process had been completed. Many more specimens will, of course, be required to determine the correctness of this proposition. It will also be necessary to compare the fossil specimens with Bronner's (1996) detailed database.

Chlorotalpa sclateri (Broom, 1907) (Sclater's golden mole)

One mandible that may be referable to *Chlorotalpa sclateri* was recovered from M5E-O. The genus was listed by Pocock (1987) and the extinct form *C. spelea* was recorded by De Graaff (1960). The fossil and modern forms are separated solely on cranial proportions (Broom 1941) and there is no *a priori* reason to propose that the present mandible belongs to an extinct species. The absence of *Chlorotalpa sclateri* from later samples and from the area today indicates that this taxon has not inhabited the region for a considerable period.

Soricidae

Crocidura silacea Thomas, 1895 (lesser grey-brown musk shrew)

Broom (1948) mentioned the occurrence of *Crocidura* sp. at Sterkfontein but subsequent workers failed to confirm the presence of this genus. As a result it has been accepted that *Crocidura* did not occur in the Sterkfontein Valley (Meester 1955; Pocock 1987; Avery 1998). It would appear, however, that the reason previous workers did not find it was that they were examining Early Pleistocene material. The present sample includes two mandibles from M6 and a palate from M6/M5, which suggests that it was a late arrival in the valley. The palate includes alveoli for only three teeth between I^1 and P^4, thereby clearly identifying the specimen as *Crocidura* rather than either *Myosorex* or *Suncus*, and the left P^4 belongs to *Crocidura* and not *Myosorex*. The body of a right mandible includes a P_4 that lacks both the protostylid and the metaconid typical of *Myosorex* (Butler & Greenwood 1979). The buccal cingulum of the molars is anteriorly broad, and the M_3 has an entoconid, which is a feature of *Crocidura silacea* (Meester 1963). The mandible is comparable in size with the *Myosorex* material, which suggests that it belongs with *C. silacea* rather than the considerably smaller *Suncus* material. The posterior half of a left mandible exhibits various features indicative of *Crocidura* rather than *Myosorex*. These include the shape of the condyle, the location of the muscle attachment on the condyle, and M_1 with the posterolingual rib and buccal cingulum as in *Crocidura*.

TABLE 2

Species of micromammals represented in Sterkfontein samples with total minimum number of individuals. † indicates extinct species. Modern species listed according to Wilson & Reeder (1993). See Table 1 for details of excavation units.

Family	Species	Common Name	M6	M5	M6/ M5E	M5E -A	M5E -O	M5E /M4	M4
Chrysochloridae	*Amblysomus* sp.	golden mole	x	x	x	x	x	x	
	Chlorotalpa cf. *sclateri*	Sclater's golden mole					x		
	Chrysospalax villosus	rough-haired golden mole			x	x		x	x
Soricidae	*Crocidura* cf. *silacea*	grey musk shrew	x		x				
	Myosorex tenuis	forest shrew	x		x	x	x	x	x
	Suncus varilla	lesser dwarf shrew	x		x	x	x	x	
Rhinolophidae	*Rhinolophus* cf. *capensis*	Cape horseshoe bat	x		x		x		
	Rhinolophus cf. *clivosus*	Geoffroy's horseshoe bat	x	x	x	x	x		
Vespertilionidae	*Myotis tricolor*	Temminck's hairy bat	x		x	x	x		
Muridae	*Saccostomus campestris*	pouched mouse			x				
	Dendromus melanotis	grey climbing mouse	x	x	x	x	x	x	x
	Malacothrix typica	large-eared mouse	x	x	x		x		
	Steatomys parvus	tiny fat mouse	x	x					
	Steatomys pratensis	fat mouse	x	x	x	x	x		
	Tatera cf. *leucogaster*	bushveld rat	x	x	x	x	x		
	Acomys cf. *spinosissimus*	common spiny mouse					x		
	Aethomys chrysophilus	red veld rat	x	x	x		x		
	†?*Dasymys* sp.	swamp rat	x	x	x	x	x	x	x
	Mastomys natalensis s.l.	multimammate mouse	x		x	x	x		
	Mus sp.	pygmy mouse	x		x	x	x		
	Rhabdomys pumilio	striped mouse	x	x	x	x	x		x
	Thallomys cf. *paedulcus*	tree rat	x						
	Zelotomys cf. *woosnami*	Woosman's desert rat	x	x	x	x	x		
	Mystromys albicaudatus	white-tailed rat	x	x	x	x	x	x	x
	†*Proodontomys cookei*				x	x	x	x	x
	Otomys irroratus	vlei rat	x	x	x	x	x		
	Otomys saundersiae	Saunders's vlei rat	x	x	x	x	x	x	x
	Otomys sloggetti	Sloggett's rat		x	x	x	x		x
Myoxidae	*Graphiurus* sp.	dormouse	x		x	x	x		
Bathyergidae	*Cryptomys hottentotus*	common molerat	x	x	x	x	x	x	x
	Georychus capensis	Cape molerat		x			x		
Macroscelididae	*Elephantulus intufi*	bushveld elephant-shrew	x	x	x	x	x	x	x
	Elephantulus fuscus	Peters's short-snouted elephant-shrew				x		x	
	Macroscelides proboscideus	round-eared elephant shrew	x						
	Minimum number of individuals represented		308	138	430	371	866	42	36

Myosorex tenuis Thomas and Schwann, 1905 (dark-footed forest shrew)

Most of the soricid material is referable to *Myosorex* and there is no reason to suggest that a different species is represented at Sterkfontein from that occurring at Swartkrans. Material has previously been assigned to the extinct *M. robinsoni* (De Graaff 1960), which was at one time said to be an ancestral form of *M. varius* (Brain 1981, based on an implied relationship in Meester [1958] but not an explicit relationship in the original diagnosis [Meester 1955]). Butler & Greenwood (1979), on the other hand, consider *M. robinsoni* to be a close relative of modern *M. cafer tenuls*, as understood by Heim de Balsac & Meester (1977) and Meester *et al.* (1986), or *M. tenuis*, as recognized by Hutterer (1993) and accepted here. The disposition of the anterior palatal foramina has been discussed previously (Avery 1998). It therefore needs only to be pointed out here that the pattern in the two Sterkfontein specimens (one each from M5E-A and M6) where it is visible is closer to *M. varius* than *M. cafer*, as shown by Meester (1958). It conforms, however, to the pattern in *M. cafer tenuis* shown by Butler & Greenwood (1979) so that it would appear that the Sterkfontein material should be assigned to *M. tenuis sensu* Hutterer (1993).

CHIROPTERA

Rhinolophidae

Rhinolophus Lacépède, 1799 (horseshoe bat)

Present evidence agrees with Pocock's (1987) findings that two species of *Rhinolophus* are represented and tends to support his assignment of the larger specimens to *R. clivosus*. This identification is based on the fact that, in the four specimens where it is preserved, the P_3 alveolus is located outside the toothrow as it is in *R. clivosus*. It is not possible to determine whether the smaller specimens should be assigned to *R. darlingi*, as suggested by Pocock (1987), or to *R. capensis*, as proposed for Swartkrans (Avery 1998).

RODENTIA

Muridae

Saccostomus campestris Peters, 1846 (pouched mouse)

Saccostomus campestris, as presently understood (Musser & Carleton 1993), may well comprise more than one species in southern Africa (Gordon 1986; Gordon & Rautenbach 1980). However, until additional species are formally recognized and their morphological characteristics are established, it is necessary to refer material to *S. campestris sensu lato*, as was previously discussed for Gladysvale (Avery 1995). Four mandibles referable to *S. campestris* have been recovered from adjacent squares O59 and O60 at depths from 17 ft (5.2 m) to 19 ft (5.8 m). These constitute the first *S. campestris* specimens recorded from the Sterkfontein Valley australopithecine sites. It is significant that the deposits that yielded this material are Upper Pleistocene (K. Kuman, pers. comm.). Moreover, the apparent absence of *S. campestris* from earlier deposits supports Denys's (1990) hypothesis that the taxon migrated south some time after about 1.6 my.

Three lower first molars from Sterkfontein measure 2.2 x 1.3 mm, 2.1 x 1.3 mm and 2.1 x 1.4 mm. These measurements lie within the range of *S. campestris* as given by Denys (1990) whereas two molars from the Cave of Hearths fall within the size range of East African *S. mearnsi* (Denys 1990). What is more important, the Sterkfontein specimens should be referred to *S. campestris* rather than to *S. mearnsi* using the various features in M_1 listed by Denys (1988) to distinguish the two species. Only an indication of a link between the anterior two cusps (a-lab, a-ling) (cusp terminology after Musser 1981) and the central two cusps (pd, md) was found in the more worn specimen while no link existed in the less worn specimens. Conversely, in the two less worn individuals the cusps pd, md and hd, ed (the central and posterior rows respectively) are already joined, thereby indicating that the two pairs of cusps are not deeply separated.

Saccostomus campestris occurs in some units at Gladysvale (Avery 1995). It could be argued that its presence suggests that these units are younger than those that have not yielded the taxon. The presence of *S. campestris* with one possible *Proodontomys cookei* in the Pink Breccia appeared to nullify this hypothesis. However, re-examination of the specimens concerned (both right mandibles without cheek teeth) has led to the conclusion that they should be assigned to *Mastomys* sp. rather than *S. campestris*. Measurements of two *S. campestris* lower first molars (2.2 x 1.4 mm and 2.1 x 1.4 mm), from units S18.E6 and S19.E6, fall within the range of *S. campestris*, as given by Denys (1990). These specimens also accord with Denys's (1988) description of *S. campestris* rather than that of *S. mearnsi*.

Steatomys parvus Rhoads, 1896 (tiny fat mouse)

Previously, only one species of *Steatomys* has been recorded from the Sterkfontein Valley (Pocock 1987, Denys 1990, Avery 1998). The present study revealed three mandibles (one from M6 and two from M5) that belong to a second, smaller species than the rest of the specimens. Length and breadth of M1 in these mandibles are lower than they are in all other samples (Figure 1). Unpaired *t*-tests of length and breadth of lower M1 show that there is a significant difference between the small individuals and both the earlier M5E-O material and, more significantly, the apparently contemporary sample from M6 (Table 3).

All three mandibles contain M_{1-2} but the teeth in one mandible are little worn while the others are in a more advanced state of wear. The unworn first molar of the small species has a maximum length of 1.7 mm whereas four specimens of the larger species from the same sample have an average length of 2.0 mm. The teeth in the Sterkfontein mandibles are more closely comparable with *S. krebsii* than with *S. pratensis*. The unworn first molar shows no trace of a cingular conule and is

TABLE 3

Results of unpaired t-tests to determine whether samples of *Steatomys* sp. belong to different species, based on maximum length and breadth of lower M1. Spar is modern *S. parvus*. *t*-values are significant at the at the 1% (**) or 0.1% (***) level.

Maximum Length: Samples	df	*t*	Maximum Breadth: Samples	df	*t*
M5E-O, M6	9	-3.65**	M5E-O, M6	9	-3.41**
M5E-O, M6/5	20	-2.61*	M5E-O, M6/5	20	-3.05**
M5E-O, Spar	5	2.46	M5E-O, Spar	5	4.79**
M6, M6/5	23	-0.39***	M6, M6/5	23	-0.33
			M6, Spar	8	4.49**
M6/5, Spar	19	3.98***	M6/5, Spar	19	4.05***

relatively narrow, although this is difficult to quantify. Examples of modern *S. parvus* were not available for study. However, Thomas & Wroughton (1905) remark that the closest relative of *S. minutus* (now included in *S. parvus* [Musser & Carleton 1993]) appears to be *S. pentonyx* (now *S. krebsii* [Musser & Carleton 1993]). This view seems to be implicitly supported by Roberts (1931) in his descriptions of *S. chiversi* (now *S. krebsii* [Musser & Carleton 1993]) and *S. c. tongensis* (now *S. parvus* [Musser & Carleton 1993]). It seems probable therefore that the small Sterkfontein specimens should be referred to *S. parvus*.

Steatomys parvus does not currently occur closer than northern KwaZulu-Natal, which is some 500 km to the east of Sterkfontein. On geographical grounds it could therefore be considered more reasonable to assign the material to *S. krebsii*, which does occur in the region today. Moreover, in some areas (e.g. the Western Cape) some mandibles of *S. krebsii* are close in size to some of *S. parvus*. However, modern specimens from nearer Sterkfontein are larger and very similar in size to the nearest *S. pratensis* (Roberts 1951). Besides, *Steatomys krebsii* and *S. pratensis* are not found together in northeastern South Africa today (Rautenbach 1982) although they do occur together elsewhere (Skinner & Smithers 1990). On balance it seems most likely that the species represented is *S. parvus* but the matter requires further investigation.

Dasymys Peters, 1875 (water rat)

The status of *Dasymys* has been discussed at some length elsewhere (Avery 1998) where it was concluded that two species are probably represented at Swartkrans. The sample from Sterkfontein is much smaller but supports the previous contention (Avery 1998) that this genus requires attention. At Swartkrans the two putative species are represented approximately equally. The two taxa were separated initially on the presence or absence of a crest between the anterolingual cusp and metaconid on the lower first molar. In the Sterkfontein sample there is a crest in 15 out of 16 specimens where the feature is visible; the exception may not show the feature because it belonged to a young individual. This age difference could, however, be significant because there is some evidence at Swartkrans that age, or degree of tooth wear, may have caused an artificial distinction between the two forms. If the difference is real, it is of interest that the young specimen was recovered from Member 4 whereas the other specimens came from later members, including M6. This would indicate that two putative species apparently co-existed for a considerable period. It would further suggest that modern *Dasymys incomtus* (represented by the species without the crest) was already present more than two million years ago whereas the second species, if it is extinct, became so within the last 120 000 years. Denys (1990) and Misonne (1969) both considered that the Pleistocene *Dasymys* (presumably the crested form) possessed some features that are more advanced than those found in *D. incomtus* and the Sterkfontein specimen may support their contention. Crawford-Cabral (1983) found *D. incomtus* and *D. nudipes* to be sympatric in one region of Angola, which provides a modern analogue for the co-occurrence of two species in the Sterkfontein Valley. However, the molars of *D. nudipes* are very similar to those of *D. incomtus* and do not exhibit the crest found in the fossil material (Crawford-Cabral & Pacheco 1989; pers. obs.).

TABLE 4

Results of unpaired *t*-tests to determine whether samples of *Mus* spp. are separable based on percentage length of lower M1 to lower M2. *t*-values are significant at the 5% (*) or 0.1% (***) level.

Samples	df	*t*
M. minutoides, *M. musculus*	28	5.45***
M. minutoides, *Mus* sp.	18	4.01***
M. musculus, *Mus* sp.	14	1.33*

TABLE 5

Micromammalian taxa recorded from Sterkfontein by various workers, with the units examined. † indicates extinct species. STS is the Type Site, STW the West Pit, and SE the Extension.

			This paper	Denys 1990	Pocock 1987	1969	De Graaff 1961	1960
				SE	STS & STW	Dump 8*	?STS	STS**
Insectivora	Chrysochloridae	*Amblysomus* sp.	x					
		Chlorotalpa sclateri	x					
		†*Chlorotalpa spelea*						x
		Chlorotalpa sp.			x			
		Chrysospalax villosus	x					
		Chrysospalax sp.			x			
		Gen. nov.			x			
	Soricidae	*Crocidura silacea*	x					
		†*Myosorex robinsoni*						x
		Myosorex tenuis	x					
		Myosorex sp.			x	x		
		Suncus infinitesimus			cf.	x		
		Suncus varilla	x		cf.	x		
		Suncus sp.						x
Chiroptera	Rhinolophidae	*Rhinolophus capensis*	cf.					
		Rhinolophus clivosus	cf.		cf.	cf.		
		Rhinolophus darlingi			x	cf.		
	Vespertilionidae	*Myotis tricolor*	x		cf.			
		Miniopterus schreibersi			cf.			
Rodentia	Muridae	*Saccostomus campestris*	x					
		Dendromus melanotis	x			cf.		
		Dendromus mesomelas					x	cf.
		Dendromus sp.		x	x			
		Malacothrix typica	x					
		Malacothrix sp.		x	x	x		
		Steatomys parvus	x					
		Steatomys pratensis	x					
		Steatomys sp.		x	x	x		
		Tatera brantsii					cf.	cf.
		Tatera leucogaster	cf.		cf.			
		Tatera sp.		x		x		
		Acomys spinosissimus	cf.					
		Acomys sp.		x	x			
		Aethomys chrysophilus	x		x	cf.		
		Aethomys namaquensis					cf.	cf.
		Aethomys sp.		x				
		Arvicanthis sp.					?	?
		Dasymys incomtus					x	cf.
		?†*Dasymys* sp.	x	x	x	x		
		Grammomys sp.		x				
		Lemniscomys sp.		x				
		Mastomys coucha					x	
		Mastomys natalensis	s.l.			cf.		cf.
		Mastomys sp.		x	x	x		
		Mus minutoides						cf.
		Mus musculus				cf.		
		Mus sp.	x	x	x			
		Pelomys fallax					cf.	cf.?
		†*Rhabdomys 'minor'*				x		
		Rhabdomys pumilio	x				cf.	cf.
		Rhabdomys sp.		x	x			
		Thallomys paedulcus	cf.					
		Zelotomys woosnami	cf.					
		Zelotomys sp.		x	x			
		Mystromys albicaudatus	x					
		†*Mystromys hausleitneri*		x	x	x	x	x
		†*Proodontomys cookei*	x		x			
		†*Otomys gracilis*		x	x	cf.	x	x
		Otomys irroratus	x					
		Otomys saundersiae	x					
		Otomys sloggetti	x					
	Myoxidae	*Graphiurus* sp.	x		x	x		
	Bathyergidae	*Cryptomys hottentotus*	x		x	cf.		
		†*Cryptomys robertsi*			x		x	x
		Georychus capensis	x					
Macroscelidea	Macroscelididae	†*Elephantulus antiquus*			x			
		Elephantulus brachyrhynchus			cf.			
		Elephantulus fuscus	x					
		Elephantulus intufi	x					
		†*Elephantulus langi (= broomi)*						x
		Macroscelides proboscideus	x		cf.			
		†*Mylogale spiersi*						?
		No. of taxa recognized	34	15+	30	19	11	17

* M5 (Brain 1981) ** probably M4 (Brain 1981) + Muridae only

Mus Linnaeus, 1758 (mouse)

There are seven mandibles referable to *Mus* from Sterkfontein, two each from M6, M5E/M6 and M5E-O, and one from M5E-A. All specimens possess the first molar while three also have the second molar. Neither of the M6 lower first molars has an anterocentral cusp, which is present in the others. All have a posterior cingulum but only two have posterolingual cusplets. This variation is similar to that found at Swartkrans and is not useful in determining the species involved. The amount of reduction in three preserved third-molar alveoli suggests *M. minutoides* but the percentage length of M_1 to that of M_2 indicates a significant difference from modern *M. minutoides* and *M. triton* (Figure 2). In this feature both the Sterkfontein and the Swartkrans material is closest to *Mus musculus* , which probably implies the presence of the same or closely allied species at both sites.

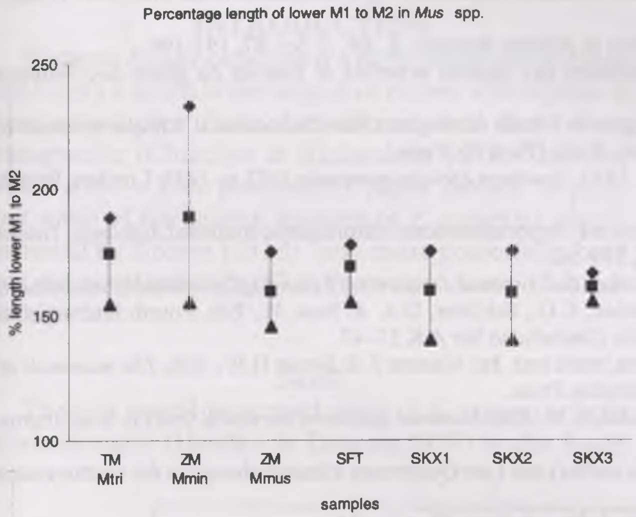

Figure 2. Mean, maximum and minimum percentage length of M_1 to M_2 in modern *M.triton* (TMMtri) from the Transvaal Museum, and *M.minutoides* (ZM Mmin) and *M.musculus* (ZM Mmus) in the South African Museum compared with fossil *Mus.* sp. from Sterkfontein (SAFT) and Swartkrans (SKX1, 2 and 3). Sample size: TM Mtri - 9; ZM Mmin - 16; ZM Mmus - 10: SFT - 3; SKX1 - 16; SKX2 - 9; SKX3 - 2

DISCUSSION

The list of species from Sterkfontein appears to be long (Table 5) when the work of De Graaff (1960, 1961), Pocock (1969, 1987) and Denys (1990) is combined with the results of the present study. However, there are many cases of alternative specific identifications and the maximum number of taxa identified in one sample is 34. A further 11 were either not found or not accepted. Reasons for differences in specific identifications vary. In some instances one of two closely related modern species may be represented. Examples are *Rhinolophus capensis* and *R. darlingi, Dendromus melanotis* and *D. mesomelas*, and *Aethomys chrysophilus* and *A. namaquensis*. There are also several possible chronospecies and it is perhaps a matter of opinion whether the extant form or a fossil antecedent is represented at Sterkfontein. These include *Myosorex robinsoni— tenuis* and *Elephantulus broomi — intufi* (see Corbet & Hanks 1978). Finally, genera such as *Arvicanthis, Pelomys* and *Mylogale* were at one time considered to be represented (De Graaff 1960) but have not been reported more recently. Conversely, genera such as *Chrysospalax, Grammomys*, *Lemniscomys* and *Zelotomys* were later added to the list (Pocock 1987, Denys 1990) and still other additions are proposed in this report. It is therefore clear that there is a critical need for a re-examination of all available material based on current taxonomy. Such a consistent examination should eliminate duplications and inaccuracies, and can be expected to reduce the list still further.

Some of the new additions listed in this report almost certainly result from the inclusion of Late Pleistocene samples for the first time rather than from differences of taxonomic opinion. This is suggested by the exclusive occurrence of four genera and one species in the later samples (Table 2), where only *Macroscelides proboscideus* was previously listed (Table 5). It will thus be important in future work to distinguish between samples of such different ages when compiling faunal lists. By providing intermediate examples, later material from Sterkfontein will also be important for evaluating the likelihood that species found in the Early Pleistocene levels are distinct from modern taxa. Early Pleistocene forms seem previously to have been considered extinct solely because of their age but there is no intrinsic reason why a species may not exist for two million years. It is also worth emphasizing that size alone is not a good criterion for distinguishing non-contemporary taxa. Thus, the two species of *Steatomys* in M6 can be distinguished on size because they are contemporary. Conversely, asynchronous samples cannot be separated on this basis even if they have a significantly different mean size (Table 3) because extraneous factors such as climate may influence size (Klein 1991).

The present samples confirm the richness of the Sterkfontein micromammalian fauna shown by Pocock (1987). At the same time, they highlight the amount of work that still needs to be done before the fauna is properly understood.

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