Postural Behaviour of Later Stone Age People in South Africa

Article *in* The South African Archaeological Bulletin · December 2004

DOI: 10.2307/3889243

Genevieve Dewar
University of Toronto

Susan Pfeiffer
University of Toronto

South African Archaeological Bulletin **59** (180): 52–58, 2004

POSTURAL BEHAVIOUR OF LATER STONE AGE PEOPLE IN SOUTH AFRICA

GENEVIEVE DEWAR[1] & SUSAN PFEIFFER[1,2]

[1]Department of Archaeology, University of Cape Town, Rondebosch, Private Bag, 7701 South Africa. Email: gendewar@mweb.co.za. [2] Department of Anthropology, University of Toronto, 100 St. George Street, Toronto, Ontario, CANADA M5S 3G3. Email: susan.pfeiffer@utoronto.ca

Received XXX. Accepted XXX.

ABSTRACT

Prehistoric human skeletal remains from Later Stone Age archaeological sites in South Africa were examined for evidence of habitual use of a squatting posture during life. Bony facets that are believed to be associated with habitual squatting were identified on the tali and the proximal tibial condyles of adult bones. The sample (n=98 adults) was found to exhibit the highest frequency yet reported of the lateral F squatting facet on the talus. A high frequency of medial traits is also reported, including both the medial squatting facet and medial condylar rounding, which have been rare in other populations. The expression of traits does not vary significantly with broadly defined time periods, age at death, or sex. Individuals from the same region show similar patterns of squatting facets but there is considerable inter-regional variation among the Western Cape, the Southern Cape, and the Eastern Cape. The pattern of traits related to squatting postures is consistent with lean body build, where there is little soft tissue resistance to deep joint flexion. Most adults appear to have regularly assumed the squatting posture but there may have been regional differences in stance preferences.

Keywords: talus, squatting facets, Khoesan, Holocene, hunter-gatherers, pastoralists.

Introduction

It is worthwhile identifying those characteristics of human behaviour that manifest themselves within the skeleton. If a population commonly shows a particular trait or group of related traits, this information can be used in the assessment of skeletal remains of uncertain cultural context. Subtle details of behavioural traits can help to identify temporal and spatial differences among populations. Further, evidence of individual volitional behaviour contributes to our understanding of an aspect of humanity in the past.

This study was undertaken to determine whether Later Stone Age individuals from South Africa habitually assumed a squatting posture when resting or when working in a seated position. Historic accounts of Bushmen and photographic images show that squatting is a common postural behaviour among foragers of southern Africa (cf. images of the Dobe !Kung of the Kalahari region; Figs 1 & 2). We anticipate that prehistoric foragers of southern Africa also regularly adopted this position.

The idea that skeletal remains could reveal evidence of individual positional behaviour was first addressed by Thomson (1889). He tested the hypothesis that the squatting posture could be detected in the ankle and knee joints on skeletal remains. Since this pioneering study (Thomson 1889, 1890) there have been several others (Charles 1893, 1894; Sewell, 1904a, 1904b, 1905; Wood 1919-20; Martin 1932; Barnett & Napier 1952; Barnett 1954; Singh 1959, 1963; Kate & Robert 1965; Rao 1966; Satinoff 1972; Oygucu *et al.* 1998; Boulle 2001a, 2001b). The largest studies have been conducted on recent colonial-period samples from India and Australia. Studies of large prehistoric samples have been less common, the only one study of skeletons from the African continent being of Egyptians (Satinoff 1972). Given, however, that Boulle (2001a) found that the incidence of squatting facets in Europeans increased as one goes back in time, from modern to medieval samples it was to be expected that there would be evidence of squatting from prehistoric contexts. The goals of this study were therefore to determine whether Later Stone Age South Africans regularly assumed a squatting posture. If so, we wished to explore whether there are changes in patterning of the squatting traits with time, sex or age, and among adults from different regions.

Fig. 1 Dobe !Kung woman squatting, Richard Lee, 1968. (Anthrophoto, Cambridge, Mass.), Dept Anthropology, University of Toronto.

Identification of squatting

Details have been debated regarding the way in which stress placed on joint capsules creates squatting facets. Past studies have argued both against (Singh 1959, 1963) and for (Charles 1893, 1894) the facets' representing genetically inherited traits. The modern consensus is that squatting facets develop as a result of hyperdorsiflexion of the ankle, with all human populations showing the potential for their development (Trinkaus 1975; Boulle 2001b).

Regular squatting causes the development of supernumerary surfaces or articular facets on the proximal and distal tibia and on the talus due to the hyperdorsiflexion of the ankle and hyperflexion of the knees (Thomson 1889; Satinoff 1972; Trinkaus 1975; Ubelaker 1978; Boulle 2001a, 2001b), as postural stress alters the articular morphology of joints (Martin 1932; Trinkaus 1975; Ubelaker 1978, 1979) (Fig. 3). During squatting, the talus, and therefore the foot, deviates laterally with respect to the tibia (Barnett & Napier 1952) and the weight of the individual causes the formation of lateral facets on the talar neck. These supernumerary articular facets are covered by a cartilaginous layer and are subsequently visible on the dry bones as dense, smooth areas of cortical bone that are easily distinguished from the surrounding irregular, porous, non-articular surfaces (Trinkaus 1975). While Trinkaus (1975) suggests that intensive physical activity may loosen the ligaments surrounding the ankles and thus allow a wider range of joint movement, one would still need to be in extreme hyperdorsiflexion for the surfaces of the talus and tibia to come into contact and form supernumerary facets. The relatively low (2% in a modern European sample; Barnett [1954]) frequencies of talar and tibial squatting facets in modern populations are also consistent with the postulation that squatting facets are caused by squatting.

Fig. 2. Dobe !Kung man supinating his ankles while squatting. Richard Lee, 1968 (Anthrophoto, Cambridge, Mass.), Dept Anthropology, University of Toronto.

Talar squatting facets are located on the dorsal aspect of the talar neck, anterior to the trochlear surface (Fig. 4). Corresponding facets are frequently located on the anterior aspect of the distal tibia, reflecting articulation with the talus. However, as the talus is considered a more reliable indicator of squatting (Boulle 2001a), in that it exhibits evidence for squatting more often and less ambiguously than does the tibia, this study focuses on the talar component of the ankle joint.

Following Barnett's (1954) classification, Fig. 4A shows a 'normal' talus without any modification. Figs. 4B-D illustrate trochlear extensions: 4B is the forward extension of the medial articular surface beyond the anterior margin of the trochlea, 4C and 4D are the medial and lateral extensions respectively of the trochlear surface. Figs 4E & F illustrate the true medial and lateral squatting facets. A medial squatting facet is located on the distal aspect of the talar neck on the medial margin and is distinct from the trochlear surface. This facet is very rare. A lateral squatting facet is found on the distal aspect of the talar neck on the lateral margin and is either separated from the trochlear surface by a distinct groove or continuous with the trochlear surface, 'though always making a sharp angle with the line of curvature' (Barnett 1954: 510). Satinoff (1972) also identifies the E and F squatting facets, depending on whether they are separate distinct facets or if they are combined (Fig. 5).

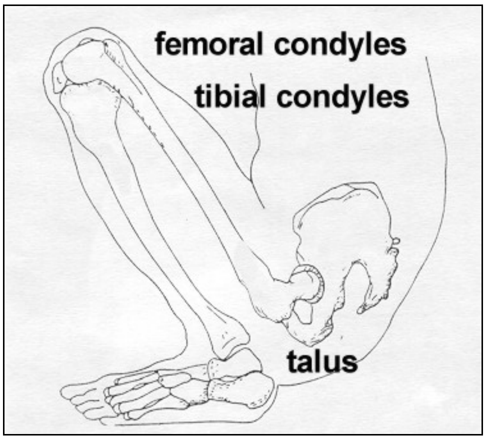

Fig. 3. Squatting position showing hyperdorsiflexion of the ankle joint and hyperflexion of the knee joint.

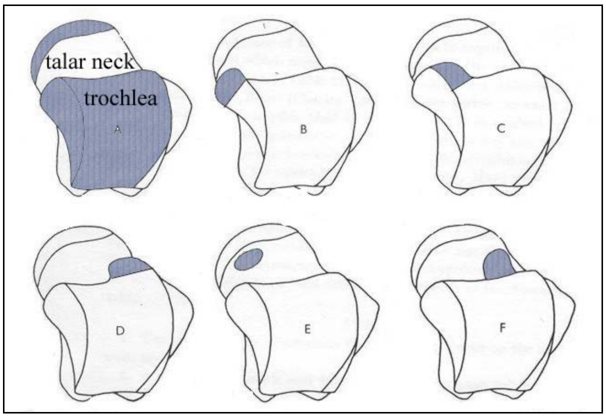

Fig. 4. Extensions and squatting facets. Shaded area of A shows normal area of articulation, while shaded areas in B-F show extensions and facets.

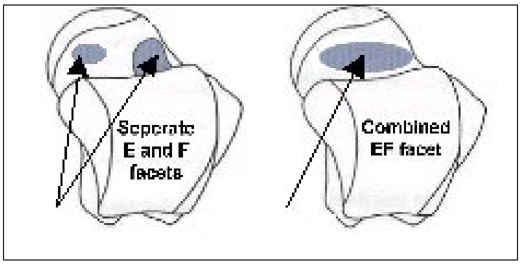

Fig. 5. The tali exhibit the different morphologies of the E and F facets. Note, the E facet is never found on its own.

Modifications to the knee joint due to hyperflexion can also be observed. Medial rotation of the tibia during hyperflexion causes the lateral femoral condyle and its meniscus to be displaced onto the posterior margin of the lateral tibial condyle, causing rounding on the posterior aspect of the tibial condyle (Trinkaus 1975) and flattening of the superior posterior aspect of the medial femoral condyle (Charles 1893). In this study, the sample size of tibiae (n=40) is greater than that of the femora (n=36), so the proximal tibiae are used for observation of this feature.

Material and methods

Later Stone Age skeletal remains held in the National Museum, Bloemfontein (NMB); the Albany Museum, Grahamstown (ALB); the Iziko South African Museum, Cape Town (SAM) and the Department of Human Biology, Medical School, University of Cape Town, Cape Town (UCT) were examined in this study. The geographical location of each burial site was recorded and includes the Western, Southern, and Eastern Cape (Appendix). All individuals have been dated using radiocarbon dating or burial context. The sample was separated into temporal categories to look, in a broad sense, for evidence of behavioral change through time. The categories are pre-3000 BP, 3000–2000 BP and post-2000 BP. The 2000 BP boundary marks the approximate time when the first domesticated animals arrived, either through diffusion from the north or by migration, affecting subsistence strategies in southern Africa (Sadr & Smith 1991; Schrire 1980; Sadr 1998, 2003). In order to exclude individuals who may have been intensively influenced by European behaviour, only those dated to more than 400 years BP were included. With more recent material, archaeological information indicates traditional cultural contexts.

The presence or absence of all traits was codified, following descriptions of squatting facets of the talus and the proximal tibia by Barnett (1954), Satinoff (1972), and Thomson (1889). The talar traits include extensions of the trochlear articular area (Figs 4B–D); facets (Figs. 4E & F) and whether these are combined or separated (Fig. 5). On the tibia, rounding of the tibial plateau of both condyles was observed.

The age and sex of individuals were estimated using pelvic and cranial traits (Morris 1992; Sealy *et al.* 1992; Sealy & Pfeiffer 2000; Parkington & Poggenpoel 1972). The left side was used unless only the right was available. Individuals were classified as young adult (ca. 20–35 years), mid adult (ca. 35–50 years), old adult (ca. 50+ years) or simply as adult (20+ years). The age of 20 years was used to separate adults from juveniles as it is the average age by which both sexes show completed fusion of the distal tibial epiphysis.

Frequencies were determined and compared by the Chi-squared test (Blalock 1979; Rowntree 1981; SSPS Base 10, 1999). When the comparison between frequencies involved only one degree of freedom, Yates' correction was used. Results were considered significant at the 95% confidence level.

Results

The study sample of 98 partial or complete skeletons (Appendix) yielded observations on 75 mature tali and 40 tibiae (one per individual in each case). All the tali exhibit expression of the B extension. That is, the A condition was not seen. The presence of the C and D extensions are high at 89% and 97% of the sample respectively. Because positional behaviours other than squatting, such as supination (kneeling and sitting on one's feet), can also create these extensions, exploration of the squatting posture must rely on quantification of the squatting facets, the E and F facets, of the talus. Of the Later Stone Age sample 99% exhibits the lateral talar, or F, facet while the expression of the E facet is found in 60% of the sample. Variability also exists in the morphology of the E and F facet with respect to each other. Nearly half of the tali with both E and F facets exhibit combined facets while the remaining individuals exhibit separate facets.

The tibial data (n=40) are consistent with the talar results, indicating the use of squatting. Ninety percent of the sample exhibits rounding on the lateral tibial plateau and 50% of the sample exhibits rounding on the medial tibial plateau.

There are no statistical differences in the expression of traits among young, mid and old adults (χ^2=1.02, 2 df, p>0.05 for the E facet; χ^2=1.23, 2 df, p>0.05 for combined versus separated E and F facets; and χ^2=2.7, 2 df, p>0.05 for tibial condyle rounding). There are also no statistically significant differences between men and women (χ^2=0.09, 1 df, p>0.05 for the E facet; χ^2=0.23, 1 df, p>0.05 for combined versus separated E and F facets; and χ^2=1.2, 1 df, p>0.05 for the tibial condyle rounding).

Neither are there statistical differences in the expression of the medial squatting traits by age at death (χ^2=4.45, 2 df, p>0.05 for frequency of E facet**;** χ2=3.3, 2 df, p>0.05 for combined versus separate E and F facets) with the exception of rounding on the tibial condyles (χ^2=10.2, p<0.01). Half of the tibiae from individuals dated to greater than 3000 BP exhibit tibial rounding, half on the lateral condyle and half on both condyles. Between 3000 and 2000 years BP this changes and 73% individuals exhibit rounding on both condyles. Finally, within the past 2000 years, the dominance changes, with 86% exhibiting rounding on the lateral condyle alone.

With regard to regional differences (Table 1), the Western Cape sample (n=15) exhibits a low frequency of the E facet, a predominance of separate E and F facets, when they are present, and predominance of rounding on both tibial condyles. The Southern Cape sample (n=44) exhibits a high frequency of the E facet, prevalence of separated E and F facets and only 50% of tibiae with rounding on both tibial condyles. The Eastern Cape sample (n=17) has the highest frequency of E facet, a dominance of combined E and F facets and rounding on the lateral condyle or most tibae.

Discussion

In comparison with published results from other samples, skeletons from the Later Stone Age show frequencies comparable to the highest reported for talar facets. Comparative values for the B extension range from 91% to 100%; the frequency of the C extension ranges from 11% to 79%, and the D extension ranges from 54% to 90% (Barnett 1954; Charles 1893; Singh 1959, 1963; Satinoff 1972; Wood 1919-1920). The same is true for the squatting facets E and F. The Australian sample (n=238) had a frequency of 33.6% for the F facet and 1.2% for the E facet (Rao 1966); the Punjabi sample (n=300) had a frequency of 28.6% for the F facet and 0.33% for the E facet (Singh (1959); while the ancient Egyptian sample (n=300) exhibited a frequency between 32% and 96% for the F facet, depending on how one reads the data, and 32% for the E facet (Satinoff 1972).

Table 1. The frequency and morphology of traits by region. As 74 of the 75 tali studied express the F facet, the top of this table analyses the expression of the medial E facet with respect to the F facet.

Trait	Western Cape	Southern Cape	Eastern Cape
Talus			
E facet	5/14	28/44	12/17
	χ^2=6.17, 2 df, p<0.05		
EF combined	4/5	9/28	8/12
E&F separated	1/5	19/28	4/12
	χ^2=9.66, 2 df, p<0.01		
Tibia			
Lateral rounding	2/12	5/10	12/15
Both rounding	10/12	5/10	3/15
	χ^2=10.79, 2 df, p<0.01		

E facet: number of tali that express the E facet. EF combined: number of individuals that exhibit both the E and F facets in the form of one continuous facet. E&F separated: presence of both the E and F facets as separate facets. Lateral rounding: individuals that exhibit rounding on only the lateral condyle. Both rounding: individuals with rounding on both condyles.

Thus, it seems that squatting was ubiquitous among Later Stone Age South Africans. The absence of significant differences among age classes suggests that habitual positional behaviours were adopted early in life. Results also indicate similar patterning between men and women. The wealth of skeletal postural indicators from the ankle and knee region suggest that body mass was sufficiently low that there was little soft tissue to obstruct the deep flexion of the joints. During normal squatting the talus deviates laterally with respect to the tibia (Barnett & Napier 1952) and the weight of the individual causes the formation of the lateral traits on the talar neck. At the same time, the femora deviate laterally with respect to the tibia, creating rounding on the lateral tibial condyle. The high frequency of medial traits on both the talus and tibia suggests that, while prehistoric South Africans were using 'normal' squatting, some individuals were also utilizing a modified squatting position or some unidentified position. Perhaps these people had more flexible joints than those studied elsewhere and were able to freely move the joints while squatting.

Satinoff (1972) postulated that one would find the E and F either as separated units or combined into one facet (Fig. 5). The reasons for the formation of separate versus combined E and F facets are difficult to determine with confidence. Perhaps individuals supinated their feet while squatting or sat with one leg bent. Ethnographic studies of the modern Dobe !Kung show that individuals were able to supinate their feet while squatting (Fig. 2). Supination during squatting would transfer an individual's weight onto the medial side of the talar neck, forming medial facets. One possible reason for the formation of separate facets is that the meniscus capsule that surrounds and protects the articular surfaces of the ankle joint, encroached upon the talar neck, preventing fully formed combined facets.

Variability is seen in the expression of the medial traits such as the frequency of the E facet, the morphology of the E facet with respect to the F facet, and the morphology of the tibial condyles. The apparent changes through time in the pattern of tibial condyle rounding are unexpected as they do not correspond with any of the other traits. However, the data mimic the results for inter-regional variation and may reflect the archaeological visibility of burials in the different regions, rather than a fluctuation through time throughout southern Africa. The skeletons available for study from the three regions are not evenly distributed temporally. For example, 11 of the 15 individuals in the 2000-400 yrs BP category are from the Eastern Cape. The dominance of rounding on the lateral condyle that is associated with the Eastern Cape may reflect a regional difference or it may reflect a temporal one. Reasons for proposing that the differences are more appropriately seen as regional than as temporal include the observation that no other traits studied here exhibit a significant temporal difference whereas both the distribution of the E facet and the morphology of the E and F facets do change between regions in accordance with the tibial data. Furthermore, previous studies of skeletal remains from the three regions have suggested inter-regional differences in rugosity of muscle insertion sites (Churchill & Morris 1998) and patterns of upper limb robusticity (Stock & Pfeiffer 2004). Nevertheless, a more nuanced analysis might clarify the interaction between region and time in postural preferences.

Conclusions

The high frequency of the expression of talar extensions and squatting facets, relative to that found in other studies, suggests that Later Stone Age adults habitually hyperdorsiflexed their ankle joints. Indications of postural behaviour are clearly established by early adulthood and are similar in men and women. The common presence of facet extensions, separate facets and rounded joint surfaces suggests that body mass was lean, so that joint flexion was unhindered. A physically vigorous lifestyle may have contributed to ligamentous flexibility, as suggested by Trinkaus (1975), further supporting the development of squatting facets. The skeletons in this sample exhibit a high frequency of medial traits compared to that found in other populations. The presence of the talar E facet suggests that some individuals were utilizing the medial aspect of the ankle joint often enough to create supernumerary facets. In some individuals the E and F facets are combined, most likely due to habitual postural stress directed onto the centre of the talar neck, caused by direct pressure, repeated supination of the feet during squatting or use of some other unidentified positional behaviour in conjunction with normal squatting.

The morphology of the knee joint indicates that some adults were following habitual behaviours other than normal hyperflexion. Normal hyperflexion in the knee joint is indicated by rounding on the lateral tibial condyle and several individuals have rounding on both condyles. This is consistent with the talar data in suggesting that some individuals were utilizing positional behaviours that caused lateral tibial rotation. We suggest that supination while squatting caused this pattern.

While there is a statistically significant difference in the expression of the tibial rounding through time, this result may be a function of the differences in the antiquity of skeletons from the three regions. There are statistically significant differences among the Western Cape, Southern Cape and Eastern Cape in the expression of the E facet, the morphology of the E and F facets and the morphology of the tibial condyles. Thus, this study suggests that there may have been variation in how people behaved across the landscape. While most of the skeletons examined in this study represent foragers, some of those younger than 2000 years may represent pastoralists. Since the regional groupings used in this study include skeletons that are not identical in their antiquity, the three regions may include different ratios of forager and pastoralist peoples. As further research identifies ways to distinguish prehistoric lifeways, the postural indicators explored in this research may be useful in helping to differentiate groupings.

This study has identified which lower limb postural indicators are ubiquitous and which are variable in adult skeletons of foragers and putative pastoralists of pre-European southern Africa. The variability may be a function of regional terrain, physique and activities of daily living. Other approaches to the reconstruction of prehistoric behaviour in southern Africa could benefit from incorporating these indicators of postural behaviour as we work toward understanding past behavioural adaptations.

Acknowledgements

This research was funded by the Faculty of Arts and Science, University of Toronto, through their undergraduate research opportunities programme, and by the Social Sciences and Humanities Research Council of Canada. Further funding came from PAST, the National Research Foundation of South Africa and the Department of Archaeology, University of Cape Town. James Brink (National Museum, Bloemfontein) Johan Binneman (Albany Museum, Grahamstown), Alan Morris (Medical School, University of Cape Town) and Graham Avery (Iziko Museums of Cape Town) arranged access to the skeletal material in their care. We thank Judith Sealy for assistance in the field, for information about radiocarbon dates and for comments on earlier drafts.

References

Barnett, C.H. 1954. Squatting facets on the European talus. Journal of Anatomy 88: 509-513.

Barnett, C.H. & Napier, J.R. 1952. The axis of rotation at the ankle joint in man: its influence upon the form of the talus and the mobility of the fibula. Journal of Anatomy 86:1-9.

Blalock, H. 1979. Social statistics 2nd edition. New York: McGraw Hill.

Boulle, E.L. 2001a. Evolution of two human skeletal markers of the squatting position: a diachronic study from antiquity to the modern age. American Journal of Physical Anthropology 115: 50-56.

Boulle, E.L. 2001b. Osteological features associated with ankle hyperdorsoflexion. International Journal of Osteoarchaeology 11: 345-349.

Charles, R.H. 1893. The influence of function, as exemplified in the morphology of the lower extremity of the Punjabi. Journal of Anatomy (and Physiology) 28: 1-18.

Charles, R.H. 1894. Morphological peculiarities in the Punjabi and their bearing on the question of the transmission of acquired characters. Journal of Anatomy (and Physiology) 28: 217-280.

Churchill, S.E. & Morris, A.G. 1998. Muscle marking morphology and labour intensity in prehistoric Khoisan foragers. International Journal of Osteoarchaeology 8: 390-411.

Kate, B.R. & Robert, S.L. 1965. Some observations on the upper end of the tibia in squatters. Journal of Anatomy 99: 137-141.

Martin, C.P. 1932. Some variations in the lower end if the femur which are especially prevalent in the bones of primitive peoples. Journal of Anatomy 66: 371-383.

Morris, A.G. 1992. A master catalogue: Holocene human skeletons from South Africa. Johannesburg: Witwatersrand University.

Oygucu, I.H., Kurt, M.A., Ikiz, I., Erem, T., & Davies, D.C. 1998. Squatting facets on the neck of the talus and extensions of the trochlear surface of the talus in late Byzantine males. Journal of Anatomy 192: 287-291.

Parkington, J. & Poggenpoel, C. 1972. A Late Stone Age burial from Clanwilliam. South African Archaeological Bulletin 26: 82-84.

Rao, P.D.P. 1966. Squatting facets on the talus in Australian Aborigines. Archaeological & Physical Anthropology in Oceania 1: 51-56.

Rowntree, D. 1981. Statistics without tears: A primer for non-mathematicians. London: Penguin Books.

Sadr, K. 1998. The first herders at the Cape of Good Hope. African Archaeological Review. 15: 101-132.

Sadr, K. 2003. The Neolithic of southern Africa. Journal of African History 44: 195-209.

Sadr, K., & Smith, A. B. 1991. On ceramic variation in the south-western Cape, South Africa. South African Archaeological Bulletin 46: 107-114.

Satinoff, M.I. 1972. Study of the squatting facets of the talus and tibia in ancient Egyptians. Journal of Human Evolution 1: 209-212.

Schrire, C. 1980. An inquiry into the evolutionary status and apparent identity of San hunter-gatherers. Human Ecology 8: 9-32.

Sealy, J., Patrick, M.K., Morris, A.G., & Alder, D. 1992. Diet and dental caries among Later Stone Age inhabitants of the Cape Province, South Africa. American Journal of Physical Anthropology 88: 123-134.

Sealy, J. & Pfeiffer, S. 2000. Diet, body size, and landscape use among Holocene people in the southern Cape, South Africa. Current Anthropology 41: 642-655.

Sewell, R.B.S. 1904a. A study of the astralagus. Part I. Journal of Anatomy 38: 233-247.

Sewell, R.B.S. 1904b. A study of the astralagus. Part II. Journal of Anatomy 38: 423-434.

Sewell, R.B.S. 1905. A study of the astralagus. Part III. Journal of Anatomy 39: 74-88.

Singh, I. 1959. Squatting facets on the talus and tibia in Indians. Journal of Anatomy 93: 540-550.

Singh, I. 1963. Squatting facets on the talus and tibia in Indian foetuses. Acta Anatomica 54: 137-144.

Stock, J. & Pfeiffer, S. 2004. Long bone robusticity and subsistence behaviour among Later Stone Age foragers of the Forest and Fynbos biomes of South Africa. Journal of Archaeological Science XX.

Thomson, A. 1889. The influence of posture on the form of the articular surfaces of the tibia and astralagus in the different races of man and higher apes. Journal of Anatomy 23: 210-217.

Thomson, A. 1890. Additional note on the influence of posture on the form of the articular surfaces of the tibia and astralagus in the different races of man and the higher apes. Journal of Anatomy 23: 616-639.

Trinkaus, E. 1975. Squatting among the Neanderthals: a problem in the behavioural interpretation of skeletal morphology. Journal of Archaeological Science 2: 327-351.

Ubelaker, D.H. 1978. Human skeletal remains: excavation, analysis, interpretation. Manuals on Archaeology 2. Washington: Taraxacum.

Ubelaker, D.H. 1979. Skeletal evidence for kneeling in prehistoric Ecuador. American Journal of Physical Anthropology 51: 679-686.

Wood, W.Q. 1919-1920. The tibia of the Australian Aborigine. Journal of Anatomy 54: 232-257.

* * *

Appendix. Details of individuals studied from the Western Cape (WC), Southern Cape (SC) and Eastern Cape (EC). The grouping by antiquity is based on either direct ^{14}C dates or contextual association. The group designated >2000 falls in the latter group. Institutions (after Morris 1992): NMB - National Museum Bloemfontein; ALB - Albany Museum; SAM - Iziko South African Museum; UCT - University of Cape Town. Estimated ages: young adult (YA), mid adult (MA), Old adult (OA), and adult (A). Element studied: tibia (Tib) and talus (Tal).

Catalogue No.	Est. age at death	Est. sex	Element	Burial site	Burial context/position
>3000 BP					
ALB119	YA	M	Tal, Tib	Wilton Rock Shelter, EC	rockshelter, ochre painted slab, flexed
ALB124	YA	M	Tal	Wilton Rock Shelter, EC	rockshelter, ochre painted slab, flexed
ALB131	OA	M	Tal, Tib	Spitzkop, EC	cave, covered by rocks/slabs, side flexed
ALB136	OA	F	Tal, Tib	Spitzkop, EC	cave, covered by rocks/slabs, side flexed
ALB139	YA	F	Tal, Tib	Spitzkop, EC	cave, covered by rocks/slabs, side flexed
ALB200	YA	M	Tal	Middlekop Kloof Cave, EC	cave, under flat stone
ALB204	Y-M A	M	Tal	Veygeboom, EC	cave
NMB1233A	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233B	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233C	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233D	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233E	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233F	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233G	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233H	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233I	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233J	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233K	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1233L	A	?	Tal	Matjes River, SC	cave, burnt layer
NMB1271	A	F?	Tal	Matjes River, SC	cave, Mytilus layer
NMB1273	A	M	Tal	Matjes River, SC	cave, Mytilus layer
NMB1310MRX	A	?	Tal	Matjes River, SC	cave, btwn upper & lwr Mossel Bay Layer
NMB1437A	A	?	Tal	Matjes River, SC	cave, Wilton layer
NMB1437B	A	?	Tal	Matjes River, SC	cave, Wilton layer
NMB1437C	A	?	Tal	Matjes River, SC	cave, Wilton layer
NMB1437D	A	?	Tal	Matjes River, SC	cave, Wilton layer
NMB1437SISKX	A	?	Tal	Matjes River, SC	cave, Wilton layer
NMB1440	A	F?	Tal	Matjes River, SC	cave, confused layer ~12 ft deep
NMB1640	A	F	Tal	Robberg Cave, SC	cave, block H
NMBWILTON Sk4	A	?	Tal	Wilton Rock Shelter, EC	rockshelter
NMBSS2	A	F	Tal	Matjes River, SC	cave
NMBSS3	A	M?	Tal	Matjes River, SC	cave
SAM-AP1145	A	M	Tal, Tib	Robberg, SC	no data
SAM-AP1871	A	F	Tal, Tib	Robberg, SC	Cave D
SAM-AP3021	A	F	Tal, Tib	Robberg, SC	no data
UCT333	A	M	Tal	Klipfonteinrand, WC	cave, side flexed
3000-2000 BP					
ALB50	MA	M	Tal, Tib	Plettenburg Bay, SC	cave
ALB222	YA	M	Tal, Tib	Cape St. Francis, EC	sand dunes
NMB1639	A	F	Tal, Tib	Robberg, SC	long block A, ~2ft deep
NMBMSk2	A	F?	Tal	Matjes River, SC	cave
NMBSk1	A	F?	Tal, Tib	Matjes River, SC	cave
SAM-AP34	A	M	Tal, Tib	Tow's River mouth, SC	no data
SAM-AP1443	A	M	Tal, Tib	Gordon's Bay, WC	no data
SAM-AP1878A	A	M	Tal, Tib	Robberg, SC	Cave E
SAM-AP1889	A	M	Tal	Robberg, SC	Cave E
SAM-AP1893	A	M	Tib	Robberg, SC	no data
SAM-AP4305	A	M	Tal, Tib	Noordhoek, WC	surface of midden in dunes
SAM-AP4720	A	M	Tal, Tib	Kommetjiie, WC	no data
SAM-AP4825	A	F	Tal, Tib	Tucker's Cave, SC	cave, number 2
SAM-AP4943	A	F	Tal, Tib	Kommetjiie, WC	no data
SAM-AP5075	A	M	Tal, Tib	Cape Point, WC	rockshelter, found during construction of new bridge
SAM-AP5095	A	F	Tal, Tib	Saldanha Bay, WC	midden on dune
UCT162	A	M	Tal	Ysterfontein, WC	sand dune, flexed on side
UCT222	A	M	Tib	Stompneusbaai, WC	sand dunes
UCT385	A	F	Tal, Tib	Faraoskop, WC	rockshelter
UCT386	A	M	Tal, Tib	Faraoskop, WC	rockshelter
UCT391	A	F	Tal, Tib	Faraoskop, WC	rockshelter
UCT394, Burial A	A	M	Tal, Tib	Faraoskop, WC	rockshelter

UCT396, Burial C	A	F	Tib	Faraoskop, WC	rockshelter
>2000 BP					
NMB211	A	?	Tal	Matjes River, SC	no data
NMB1451	A	?	Tal	Matjes River, SC	no data
NMBMSk5	A	M?	Tal	Matjes River, SC	cave
NMBSS1	A	?	Tal	Matjes River, SC	cave
NMB UNMARKED A	A	?	Tal	Matjes River, SC	cave
NMB UNMARKED B	A	?	Tal	Matjes River, SC	cave
NMB UNMARKED C	A	?	Tal	Matjes River, SC	cave
NMB UNMARKED “B”	A	?	Tal	Matjes River, SC	cave
2000-400 BP					
ALB126	YA	M	Tal	Port Alfred, EC	covered by single stone on head
ALB282	YA	F	Tal, Tib	Plettenburg Bay, SC	found while excavating house foundation
ALB323	OA	F	Tal, Tib	Cape St. Francis, EC	midden in dune sand, flexed on left side
ALB328	YA	M	Tib	Cape St. Francis, EC	found during construction of septic tank
ALB347	YA	F	Tib	Bushman’s River, EC	sitting flexed, found building drains for new home
ALB353	MA	M	Tal	Woodbury Farm, EC	cairn, sitting flexed
NMB1704	A	F	Tal	Plettenburg Bay, SC	midden
SAM-AP4212	A	F	Tib	Drury’s Cave, SC	cave
ALB174	YA	M	Tal, Tib	Kleinpoort, EC	cairn, sitting flexed
ALB177	M-O A	F	Tal, Tib	Kleinpoort, EC	cairn, sitting flexed
ALB180	MA	F	Tal, Tib	Near Uitenhage, EC	cave, sitting flexed with pile of stones
ALB234	MA	M	Tib	Near Grahamstown, EC	no data
ALB235	MA	M	Tal	Lower Govenorskop, EC	cairn, sitting
ALB2441	YA	F	Tib	Paardefontein, EC	mass burial exposed by flood
ALB2442	YA	M	Tib	Paardefontein, EC	mass burial exposed by flood
ALB2443	YA	F	Tib	Paardefontein, EC	mass burial exposed by flood
ALB316	M-O A	F	Tal, Tib	Groot Kommandokloof, EC	rockshelter, lying on right side flexed
UCT60	A	M	Tal, Tib	Saldanha Bay, WC	sand hill, sitting upright covered by stones
UCT97	A	M	Tib	Kommetjie, WC	no data
UCT230	A	M	Tal, Tib	Melkboschstrand, WC	no data

* * *