

## LATER STONE AGE BURIALS FROM THE WESTERN CAPE PROVINCE, SOUTH AFRICA PART 1 : VOËLVLEI

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### ABSTRACT

Two human burials eroding from the edge of a sandbank at Voëlvlei in the Mossel Bay district were excavated in a rescue dig in 1996. The analysis and dating of the skeletons indicate that they are likely to have been the skeletons of Khoekhoe pastoralist people from the period just before the arrival of Europeans at the Cape. Voëlvlei 1 is the skeleton of a tall woman who probably died in her 30's. Her dental health was reasonable but she was beginning to feel the impact of a degenerative joint disease in her right hand and elbow, and especially in her lumbar vertebrae. Sometime during her life she had broken her nasal bones. Voëlvlei 2 was an elderly man who died somewhere in his 50's or even his 60's. He was shorter than the Voëlvlei 1 woman, but still relatively tall for a KhoiSan individual. He had advanced degenerative disease throughout his skeleton and must have had reduced mobility and pain from his neck and probably several other joints.

### INTRODUCTION

Human remains were found eroding out of a sandbank on the edge of the Voëlvlei lagoon in April 1996. The discovery was reported to the South African Police and to Ms L. Labuschagne, the director of the Bartolomeu Dias Museum in Mossel Bay. Two discrete burials were exposed by erosion and although bones from one (Voëlvlei 1) were removed by the police, the second burial (Voëlvlei 2) was excavated under more controlled circumstances by Mr H. Gerstner, manager of the Cango Caves in Oudtshoorn, at the request of Ms Labuschagne. These two skeletons were submitted to A.G. Morris of the Department of Human Biology at the University of Cape Town in 1999. The specimens were analysed by students in the Department between 1999 and 2001, whose reports form the information base for this final published report.

Voëlvlei (21.50E; 34.16S) is a small lake feeding into the Gourits River, about 10 km from its mouth and about 25 km west of the town of Mossel Bay (Fig. 1). The graves were exposed on the edge of a cattle pathway leading down to the west side of the Vlei. The Vlei itself is trapped between archaic dune systems that have built up a bank

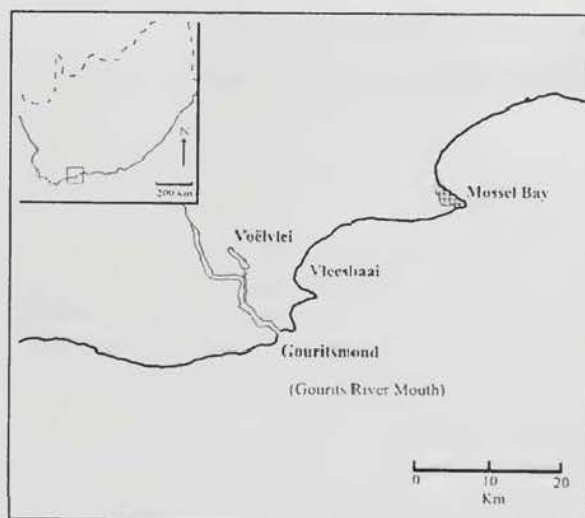


Fig. 1. Map showing location of Voëlvlei site.

around it. The bank is up to 6 metres high in places (Gerstner 1996). Both graves had been dug into grey

organic-rich sands in an area of high erosional impact (Gerstner 1996).

No records were kept of the removal of Voëlvlei 1, but Gerstner's report does provide some information about the Voëlvlei 2 burial. Gerstner took some general pictures of the site but did not formally record the skeleton exposure during excavation. The burial was in a sitting (flexed) upright position with the cranium and knees near the top of the grave shaft. Bones of the hands and feet were commingled. The grave shaft was capped by a flat stone 43 x 54 cm in dimension, and the shaft itself was only about 60 cm in width. The deepest point of the grave shaft was 63 cm below the level where human bones were first noted in the excavation. It is unclear from Gerstner's report as to the original level of the soil surface and whether or not the capping stone had been buried, but the original depth of the grave was likely to have been at least 80 cm and perhaps as much as 1 metre. No grave goods were recovered, but Gerstner noted the presence of small charcoal fragments in the grave shaft and one small "pot fragment" in the top (disturbed) layer (Gerstner 1996).

The Quaternary Dating Research Unit (QUADRU) based at the CSIR, Pretoria, has dated both Voëlvlei burials. C. Fourie of the museum in Mossel Bay submitted bone samples from Voëlvlei 1, and D. Stynder submitted samples from Voëlvlei 2. The bone collagen dating results were as follows:

Voëlvlei 1: Pta-7178 740 +/- 40 BP  $\delta^{13}\text{C}$  -11.4‰ (calibrated at 95.4% probability to between 1210AD and 1390AD).

Voëlvlei 2: Pta-8760 560 +/- 45 BP  $\delta^{13}\text{C}$  -12.8‰ (calibrated at 95.4% probability to between 1300AD and 1440AD).

#### DESCRIPTION OF VOËLVLEI 1 (UCT 582)

Despite its exposure through erosion, this specimen demonstrates extremely good preservation (Fig. 2). A few teeth have been lost post-mortem, but the skeleton is essentially complete.

The sex is unambiguously female, based on cranial and pelvic features. The delicate nature of the nuchal crest, tympanic plate and the limited gonial eversion are female features, and the wide sciatic notch, wide sub-pubic angle and projection of the pubic surface along with the evidence scars of parturition all indicate a female identity (Ferembach *et al.* 1980). The age at death is most likely to have been between 30 and 40 years based on the state of development of rib ends, pubic symphysis and iliac auricular surface (Krogman & Yücan 1986, Buikstra & Ubelaker 1994). The stature as calculated from the physiological length of the femur is  $165.1 \pm 2.8$  cm based on the SA Negro female formula (Lundy & Feldesman 1987), but much taller at 17.8 cm from the standard ratio of  $3.745 \times$  maximum femur length (Lundy & Feldesman

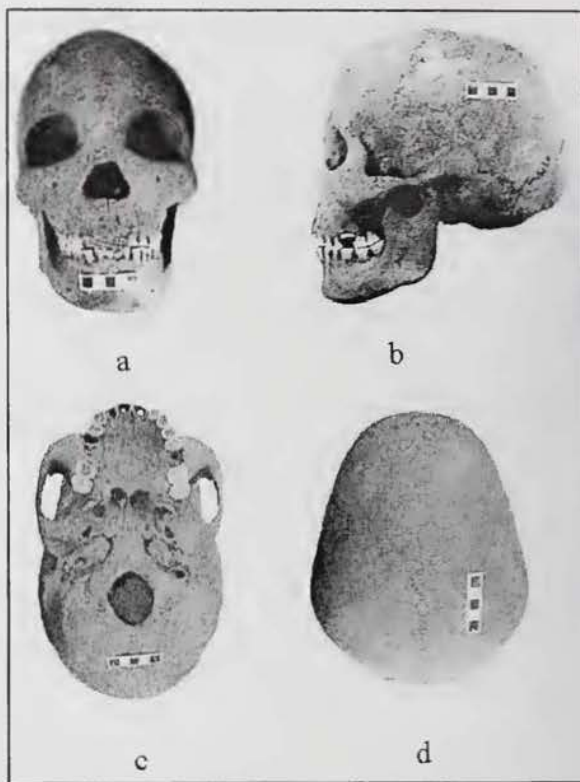


Fig. 2. Cranium of Voëlvlei 1: a) anterior view, b) lateral view, c) inferior view, d) superior view.

1989). No specific standards for age or stature are currently available for KhoiSan populations.

The left and right maxillary M2's have small interproximal cavities on their mesial aspects, and both maxillary M1's had been lost before death. The mandible displays a substantial amount of calculus on both the lingual and buccal aspects of the post-canine dentition. This has been matched with significant alveolar resorption. This is the most probable cause of the maxillary tooth loss (Hillson 1996). The caries count is 2 for 25 teeth, and the antemortem tooth loss is 2 for 32 sockets. The tooth wear is heavy for an individual of this age (Morris 1992). Maximum wear is on the anterior dentition and the lower incisors are worn down to pegs. The wear on these teeth is distinctive as it is rounded (Fig. 3).

There are some signs of degenerative joint disease in several places on the skeleton. The right ulna has some slight lipping on its humeral articulation, and the right thumb joint at the distal end of the 1st metacarpal also demonstrates some minor lipping. The fifth lumbar vertebra, on the other hand, does show some advanced osteophyte development that is also present at a lower intensity on the bodies of the other lumbar vertebrae. Schmorl's nodes are present on the inferior surface of the L3 body. The temporomandibular joints are also affected by degenerative arthritis. An interesting anomaly is present in the sacrum. The arch of the first sacral segment has not



Fig. 3. Voëlvlei 1 – occlusal wear on mandible.

fully united with the rest of the sacrum, and its medial spine is divided in the mild version of spina bifida occulta.

Tibial squatting facets are present on the distal ends of both bones.

At some time in the past, this woman had broken her nose. This is visible as a depressed fracture on the inferior half of the nasal bones and the edge of the right frontal process of the maxilla (Fig. 4). The contour is not dramatically changed although the bones are slightly depressed. The damage is well healed suggesting that the trauma had occurred a long while before death.

#### DESCRIPTION OF VOËLVLEI 2 (UCT 583)

The skeleton is almost complete, but many of the bones are fragmented and few of the long bones are whole (Fig. 5). The skeleton is unambiguously male, as confirmed both by cranial features including a marked supraorbital region, large mastoid and moderate tympanic plate, and robust pelvic features. The age of death is well over 40 years as confirmed by the pubic symphysis morphology (Buikstra & Ubelaker 1994). The auricular surface and the rib ends both suggest an individual in his 50's or even 60's at death (Buikstra & Ubelaker 1994). The stature based on the SA Negro male formula is  $159.5 \pm 3.8$  cm calculated on a humeral length of 30.8 cm (Lundy & Feldesman 1987). No other long bones are complete enough to attempt a height reconstruction.

No dental caries were seen in Voëlvlei 2, but there was some noticeable alveolar disease. Both the right maxillary and right mandibular M3 sockets are abscessed and the lower M3 roots were no longer being supported by the alveolar socket structure (Fig. 6). The mandibular left M1 socket was also diseased. Calculus is present on the buccal surfaces of all the posterior teeth. The wear on the teeth is marked in an oblique occlusal plane on the molars. This is often referred to as helicoidal wear (Tobias 1980). The anterior dentition is even more extreme and the lower incisors and canines are rounded.

The post-cranial bones and the temporomandibular joint all demonstrate severe signs of degenerative joint disease.

Not only are the joints affected, but excess ossification is present in several areas of the skeleton. Many muscular entheses are overgrown and the thyroid cartilage is ossified. The vertebral column is especially affected by disease. Osteophytes are present throughout the column on both the facet and body joints. The left facet joint of the C4/C5 articulation is entirely destroyed (Fig. 7), and the T6/T7 bodies have fused. A sixth lumbar vertebra is present, but this has fused with the sacrum to produce a sacrum with six segments.

The left 4th and 5th metacarpals are bent toward the palm at their distal ends and the left 5th metacarpal is shortened (Fig. 8). Radiographic views of the bones (Fig. 9) indicate no visible sign of healing, but the internal structure of the bone is remodeled with a thickened trabecular reinforcement of the palmar aspect. Metacarpal 4 has a restricted medullary cavity and the cortical bone of the shaft is strongly thickened. It is not clear whether or not the changes were the result of a disease process or an injury, but the metacarpals are common sites for bone fractures. Fracture of the neck of the 1st or 2nd metacarpals is often referred to as a 'boxer's fracture' and inexperienced pugilists may occasionally break the 5th metacarpal because it is more mobile and less supported even when the fist is clenched (Moore & Dalley 1999). Given the advanced age of this individual, if the cause was an injury in youth, there would have been substantial time to allow for the remodeling of the bone structure and the removal of evidence of past fractures.

Tibial squatting facets are present on the distal ends of both bones. There is also mild but healed cribra orbitalia in both orbits. The definition of healed versus active lesions is from Peckmann (2002).

#### MORPHOLOGICAL IDENTITY OF THE VOËLVLEI SPECIMENS

The general appearance of both crania is strongly suggestive of a KhoiSan genetic identity.

A number of osteological features are present that are common in KhoiSan populations but rare in others. A tympanic dehiscence (foramen of Huschke) is present bilaterally and Voëlvlei 2 also has a distinct mons temporosphenoidalis (De Villiers 1968; Morris 1992). The strongest visual similarity of these specimens to the KhoiSan range of variation is in the face, where the quadrilateral orbits and flat nasal bones are distinctive.

Multivariate confirmation of biological affinity is preferable to non-statistical visual substantiation, so the Voëlvlei specimens were compared to a modern South African sample of Nguni ( $n = 72$ ) and KhoiSan ( $n = 58$ ). The Nguni sample is made up of isiZulu, isiXhosa and siSwati linguistic groups (Shrubsall 1898), and the KhoiSan sample is a range of individuals including the large sample of pre-historic individuals from the Riet River (Morris 1992). All metric traits were corrected for size and transformed into Z-scores according to the procedure of Howells (1989). Variable related to the face were selected

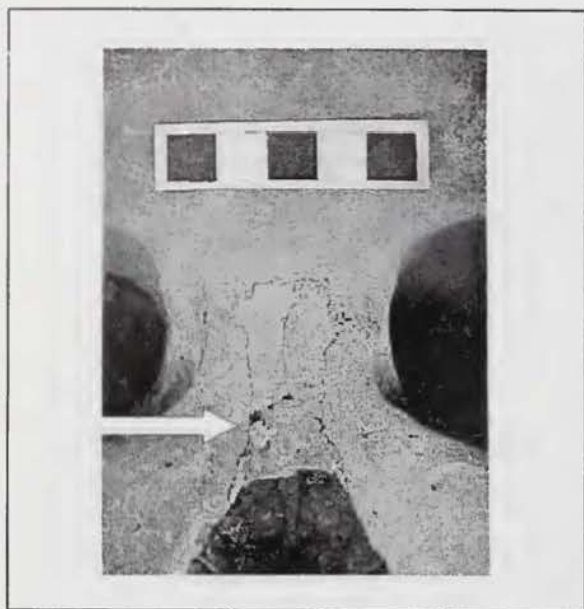


Fig. 4. Voëlvlei 1 – healed fracture of nasal bones.

through analyses of variance. The selected variables were: basion-prosthion length (BPL), greatest biorbital breadth (EKB), bistephanic breadth (STB), minimum frontal breadth (WFB), orbital breadth (OBB), and orbital height (OBH) (Martin & Saller 1959, Howells 1989). The six metric traits were used for factor analysis (Principal Component Analysis with varimax rotation). The output of the analysis is displayed as a scatterplot of regression factor scores with an ellipse of confidence ( $p = 0.7$ ) for each modern sample (Fig. 10).

Although at least 30% of the variation of the comparative groups is overlapping, there is a marked differentiation between Coast Nguni and KhoiSan, especially along Factor 1. The latter reflects a morphological trend related to breadth of face, breadth of orbits and facial projection. The trend has two extremes: a KhoiSan one of low values, and a Coastal Nguni one with high values. The Voëlvlei specimens are positioned in the middle of the KhoiSan range of variation and slightly outside of the Coastal Nguni one. The relatively narrow distance across the orbits and the flattened face place the Voëlvlei crania very close to the KhoiSan mean, suggesting that they are most probably biologically related to the KhoiSan.

#### DISCUSSION

The Voëlvlei skeletons are both of mature individuals. The woman (Voëlvlei 1) was most probably in her 30's at death and was just beginning to show signs of degenerative joint disease in her vertebrae and hands. She was a tall woman with a calculated height in excess of 165 cm in a population where women were often less than 150 cm. Sometime during her life she had experienced facial trauma as shown

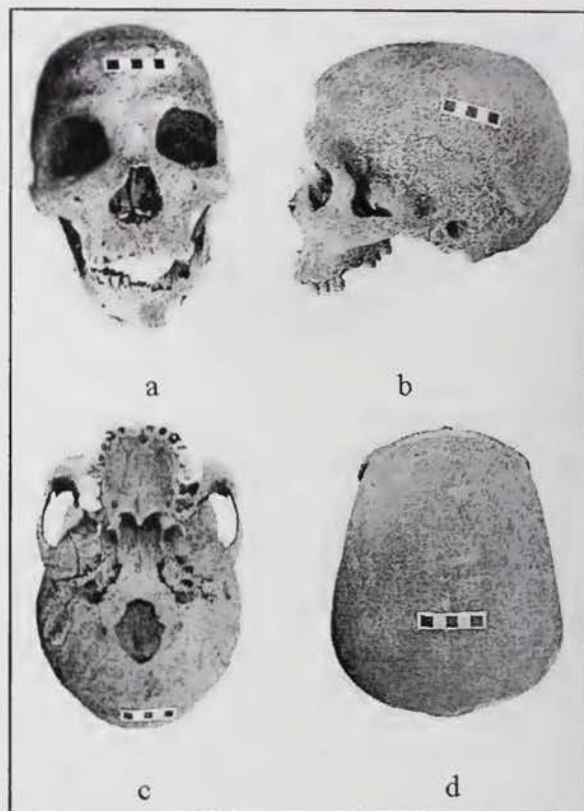


Fig. 5. Cranium of Voëlvlei 2: a) facial view, b) lateral view, c) inferior view, d) superior view.

by her broken and healed nasal bones. Voëlvlei 2, on the other hand, was a much more elderly person demonstrating advanced degenerative joint disease throughout his skeleton. This could be due to age-related changes, but it is possible that the osteological changes represent a specific disease process such as Diffuse Idiopathic Skeletal Hyperostosis (Aufderheide & Rodriguez-Martin 1998). Nearly all of his joints were affected in some way, and even the cartilaginous parts of his skeleton and his muscle origins and insertions were showing signs of excess ossification. Vertebral fusion had occurred in the mid-thoracic region limiting the rotational mobility of his back, but perhaps more significant in health terms was the extreme destruction of his cervical articular facet joints, a situation that must have been very painful. His teeth were very heavily worn, and although there was no dental disease as such, the heavy wear and associated calculus deposit had generated significant gum disease (periodontitis). A small osteological feature that may have some health significance is the presence of cribra orbitalia in the orbits of Voëlvlei 2. This is an overt sign of iron deficiency anaemia that is more commonly found in children and younger adult women but is often healed when found in adults (Larsen 1997). Patrick (1989) has shown that south Cape coast populations had a larger incidence of cribra orbitalia than inland populations and has speculated that a reliance on seafood may have

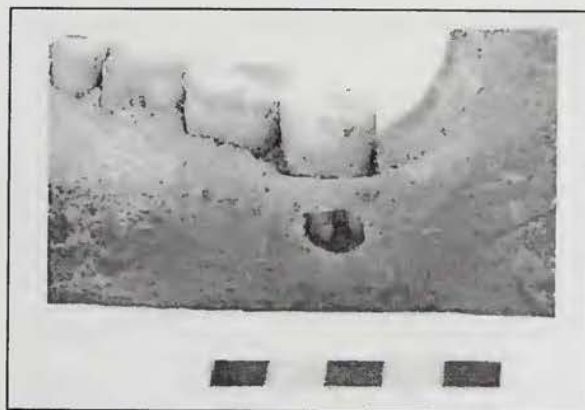


Fig. 6. Voëlvlei 2 – mandibular dental abscess.

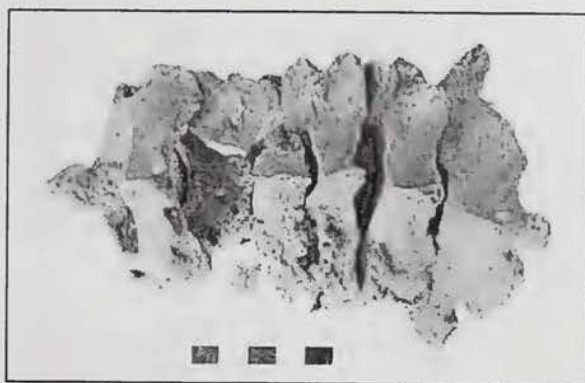


Fig. 7. Voëlvlei 2 – arthritic damage to cervical vertebral articulations.

resulted in a higher parasite load. Prehistoric Inland Cape populations seem to have had a much lower frequency of cribra orbitalia (Peckmann 2003). Both individuals had habitually used a full squatting posture as seen in the signs of hyperflexion of the ankle joint.

The pattern of dental disease and wear of these two individuals is suggestive of a general hunter-gatherer or simple pastoralist lifestyle (Morris 1992). Only two carious teeth were noted of 42 teeth from the two individuals. This uncorrected rate of 4.8% carious teeth is above the hunter-gatherer threshold of Turner (1979), but well below the high rate of caries seen in the Oakhurst site near George (Patrick 1989, Sealy *et al.* 1992). Although the antemortem losses of the teeth of the two individuals were still low, the state of the alveolus of Voëlvlei 2 would have resulted in at least three of four further tooth losses had the individual lived just a few more years. The caries and antemortem loss incidence seen at Voëlvlei is higher than for Kalahari San and other inland populations, but this is explained by the lack of fluoride in the water sources of the southern Cape (Morris 1992; Sealy *et al.* 1992) rather than a cariogenic dietary difference.

Anterior tooth wear is always more severe than posterior

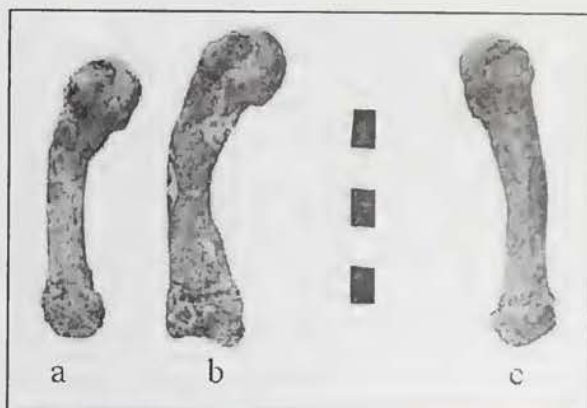


Fig. 8 (upper). Voëlvlei 2 metacarpals: a) left metacarpal 5, b) left metacarpal 4, c) right metacarpal 5.

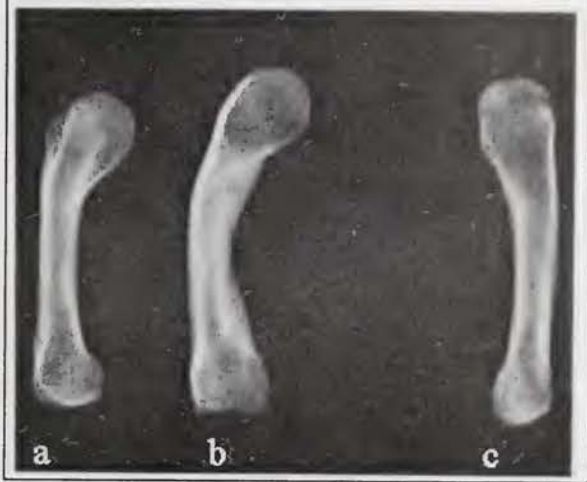


Fig. 9 (lower). Voëlvlei 2 – radiographs of metatarsals: a) left metacarpal 5, b) left metacarpal 4, c) right metacarpal 5.

wear in foragers because the front of the mouth is used for purposes other than dietary mastication (Hinton 1981). This often manifests itself in rounded incisors that do not meet in occlusion, especially in people whose heavy tooth wear brings the incisors into edge-to-edge occlusion early in adulthood (van Reenen 1964). The rounded pattern of wear is not universal with age but without detailed ethnographic sources it is difficult to speculate as to what kind of non-dietary activity produces rounding (Morris 1992). Both of the Voëlvlei individuals share rounded incisors and temporomandibular joint arthritic changes. In the case of Voëlvlei 2, osteoarthritic changes are present throughout the skeleton, but Voëlvlei 1 has very much milder postcranial symptoms and the jaw changes may be unrelated. A speculation that warrants exploration is the possible linkage between rounded incisors, temporomandibular joint osteoarthritis and the use of the front of the mouth for non-dietary purposes.

A key question that does arise from the description of these skeletons is to whether or not it is possible to differentiate between Khoekhoe and San. The radiocarbon

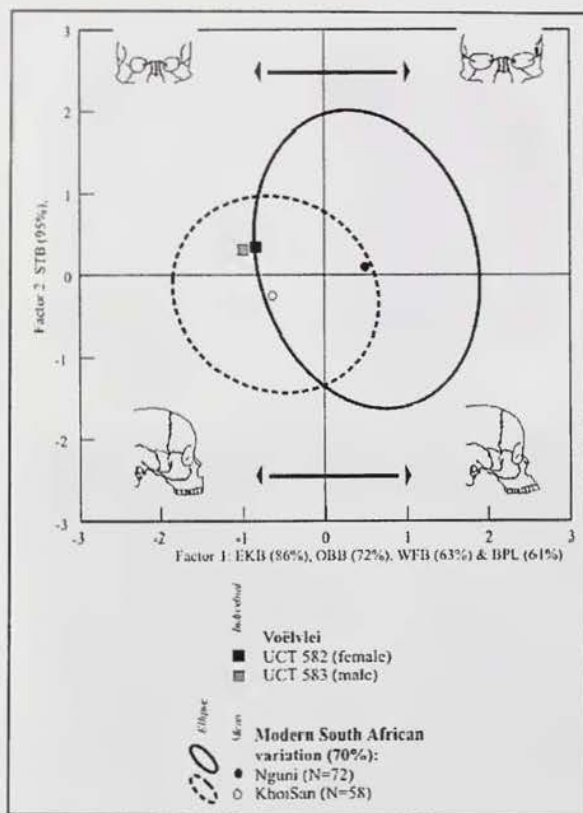


Fig. 10. Scatterplot of Regression Factor Scores for facial measurements.

dates place both of these individuals in the time period when herders and hunters were active in the region, but the limited archaeological information and lack of associated material culture provides no direct information about ethnicity. Despite that, there is some circumstantial evidence that could be used to marshal and argument that the skeletons were of Khoekhoe pastoralists rather than San hunters. The burial style was sitting upright with no grave goods, a style most frequently recorded in the historical literature for Khoekhoe populations (Inskeep 1986, Morris 1992). The stature, especially that of Voelvlei 1, is significantly higher than for earlier hunter groups from the same region. Using femur lengths rather than reconstructed heights, Sealy & Pfeiffer (2000) have demonstrated south Coast individuals between 2000 and 4000 years ago were shorter and less variable than those who came before them and after them. Using reconstructed heights from maximum femur lengths, Wilson & Lundy (1994) also suggest that stature in the post-2000BP period was higher (male 1643 mm) than in the pre-2000BP period (1530 mm). Their reference data drawn from modern ethnographic data suggest an average male Khoekhoe at 162.4cm, San male at 155.8 cm and San female at 146.1 cm. The woman from Voelvlei 1 exceeds even the Khoekhoe male average height, while the male from Voelvlei 2 fits in the higher range of the San data and in the lower range of the Khoekhoe data.

Table 1: Cranial measurements (all measurements in mm).

	Voelvlei 1 (UCT 582)	Voelvlei 2 (UCT 583)
Maximum Cranial Length	195	191
Maximum Cranial Breadth	142	145
Basibregmatic Height	130	128
Bistephanic Breadth	113	114
Biasterionic Breadth	111	112
Frontal Sagittal Arc	142	137
Parietal Sagittal Arc	120	131
Occipital Sagittal Arc	142	118
Transverse Arc	301	303
Frontal Sagittal Chord	117	112
Parietal Sagittal Chord	107	114
Occipital Sagittal Chord	101	91
Nasion-Bregma Subtense	31	30
Nasion Subtense Fraction	49	47
Foramen Magnum Length	34	38
Foramen Magnum Breadth	28	28
Mastoid Height	20	26
Least Frontal Breadth	97	94
Bifrontal Breadth	97	96
Bizygomatic Breadth	122	127
Bimaxillary Breadth	97	98
Upper Facial Height	68	71
Nasion-basion Length	102	111
Prosthion-basion Length	95	95
Bimaxillary Subtense	27	25
Naso-frontal Subtense	21	17
Inner Bi-orbital Breadth	95	95
Outer Bi-orbital Breadth	103	106
Interorbital Breadth (Dac.)	25	23
Orbital Breadth	37	37
Orbital Height	30	30
Nasal Height	45	52
Nasal Breadth	27	28
Least Nasal Breadth	8	11
Maxillo-alveolar Length	51	50
Maxillo-alveolar Breadth	62	65
Palatal Length	41	43
Palatal Breadth	37	37
Palatal Height	8	7

The stature data remain unreliable especially because of problems in the use of standardized reconstruction formulae, but the carbon isotope data add more suspicion that the people may have been drawn from a pastoralist rather than a purely foraging population. Sealy (1997) and Sealy & Pfeiffer (2000) reported on a very small sample of three individuals from the period between 1000 and 400 years before present on the southern Cape. The  $\delta^{13}\text{C}$  values ( $-12.4\text{‰}$  for the three individuals) were enriched which did not surprise them as it was predicted that marine foods would make up a significant part of the diet. The accompanying  $\delta^{15}\text{N}$  data were low in value suggesting instead that marine foods were not a major part of the diet. Their interpretation of these data was that the people of

**Table 2. Mandibular measurements (all measurements in mm).**

	Voëlvlei 1 (UCT 582)	Voëlvlei 2 (UCT 583)
Bicondylar Breadth	108	
Bicoronoidal Breadth	92	93
Bigonial Breadth	87	91
Bimental Breadth	47	40
Proj. Height of Ramus	45	
Proj. Height of Coronoid	53	53
Proj. Length of Corpus	76	78
Proj. Length of Mandible	103	
Length of Condyle	17	
Breadth of Condyle	8	
Sigmoid Notch Subtense	21	
Minimum Width of Ramus	33	36
Symphyseal Height	36	32
Corpus Height at M2	26	22
Mandibular Angle (degrees)	123	

**Table 3. Long bone lengths (all measurements in mm).**

	Voëlvlei 1		Voëlvlei 2	
	L	R	L	R
Humerus(max)	303	307	308	
Radius (max)	234			
Ulna (max)	249	250		
Femur (max)	463	466		
Femur (physiol)	460	463		
Tibia (max)	390	388		
Fibula (max)	363	363		

these relatively recent times relied more on terrestrial C<sub>4</sub> foods or on animal products from grazing domestics. In their opinion this was not enough to confirm the skeletons as those of pastoralists, hunter-gatherers, or a mixture of the two. The two Voëlvlei individuals provide  $\delta^{13}\text{C}$  values of -11.4‰ and -12.8‰, adding to the same enriched pattern seen in the data of Sealy and Pfeiffer. In comparison, the nearby 2375 year old male skeleton from Snuiiklip (Morris *et al.* 1987) was short (only 149.0 cm in stature), had a less enriched  $\delta^{13}\text{C}$  value of -14‰, and was fully consistent with other skeletons from Sealy's and Pfeiffer's data base of skeletons from the same timeperiod. When the relatively tall statures, enriched carbon isotope values and ethnographically Khoekhoe pattern of burial are considered together, the likelihood of a pastoralist and potentially Khoekhoe ethnic identity is substantially strengthened.

### CONCLUSION

The two skeletons from Voëlvlei have given us a brief glimpse of life history in the period immediately before the European settlement at the Cape.

Voëlvlei 1 is the skeleton of a KhoiSan woman who probably died in her 30's. She was quite tall for an individual from a KhoiSan population, standing somewhere between 165 cm and 173 cm depending on the height reconstruction formula used. Her dental health was reasonable although she had lost two teeth due to caries and all of her teeth showed substantial occlusal wear. She was beginning to feel the impact of degenerative joint disease in her right hand and elbow, and especially in her lumbar vertebrae. The presence of a Schmorl's node on the inferior surface of her third lumbar vertebra suggests that discal degeneration was beginning. Sometime during her life she had broken her nasal bones.

Voëlvlei 2 was an elderly man who died somewhere in his 50's or even his 60's. He was shorter than the Voëlvlei 1 woman, but still relatively tall for a KhoiSan individual. He had advanced degenerative disease throughout his skeleton and must have had reduced mobility and pain from his neck and probably several other body joints. Although his teeth were healthy, they were heavily worn and he suffered from periodontitis.

The reconstructed statures, enriched carbon isotope values and upright burial style with no grave goods are strongly suggestive that both of these individuals were from a Khoekhoe pastoralist group rather than from a foraging San population.

### ACKNOWLEDGEMENTS

Ms. Coreen Fourie, historian at Bartolomeu Dias Museum, was responsible for sending the skeleton to the Department of Human Biology for analysis and for providing the excavation records. Ms. Colette Scheermeyer at SARHA provided additional documentary information. Mr. Grcg Flash provided the LODOX radiographic images.

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