Mirabib - an archaeological study in the Namib

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Accepted: 20 June 1977

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ABSTRACT

This report provides information on what the Namib environment could have been like in the past; how people lived there and on what the past can teach us about man-environment relationships. In the course of reconnaissance work in the different environmental regions of the Namib interest narrowed down to a site on the gravel plains of the central Namib. The material recovered from the excavation in the rock shelter near Mirribib comprised well-preserved faunal, floral and cultural remains spanning the time period of the Holocene.

An intensive sedimentological analysis contributed to the reconstruction of ecological determinants and to the explanation of various degrees of preservation. A three-pronged approach to the study of plant remains supplemented the palaeo-ecological information, led to a microscopic method of anatomical identification and to an ethnobotanical study of the plant (Acacia depressa) among the Topnaar Hotentots. This, the find of a seven hundred year old skeleton and evidence of sheep herding during the fifth century A.D. constitute interesting information on the history of the central Namib.

The study of the archeo-zoological data, in particular the analysis of owl pellets, contributed to the reconstruction of climatic peaks and cycles of change. The C14 dates of charcoal and bone provided the crucial framework for comparison with data from other sites in Africa and with climatological data from the rest of the world. The Environment-Population-Culture model which is presented in a concluding discussion relates the results of this study to present day problems of management of the Namib Desert Park.

1 INTRODUCTION

Work on archaeological sites in the Namib started during the sixties (Sandelowsky and Pendleton 1970, Wendt 1972). In 1972 a project was outlined which aimed at reconstructing past environments in the central Namib Desert. Apart from general speculations on the geological history of the area, not much was known about environmental changes in the Namib (Martin 1951, Goudie 1972, Schöch 1972). A lack of dates for any changes indicated in the geomorphology was particularly obvious. The immediate purpose which archaeological material could serve would be as a dating tool which in archaeological terms might be vague, but in geological terms could be quite specific. Besides that, the archaeological data could contribute to a reconstruction of past environments and lead toward a better understanding of the relationship between man and his environment. Ultimately there would be a documentation of the history of people who lived in the Namib.

The Namib palaeo-ecology project was to fit into the programme of the Desert Ecological Research Unit (DERU), which was established in 1963 at Gobabeb in the Namib Desert Park, where the South West African Division of Nature Conservation and Tourism maintains a magnificently equipped Research Institute. The theoretical framework chosen for this archaeological work relates it to the aims and objectives of Nature Conservation. The results obtained during the first phase of intensive investigation are couched in a model which reflects the system endangering the park, its landscape and wild life. The model lends up to a suggestion for the protection of the park and envisages the cooperation of all those interested in this area.

When the Council for Scientific and Industrial Research (CSIR) made funds available for the first phase of this project, I looked for sites containing evidence of past climatic conditions and human occupation. These were found along the coast, along the river courses, in the dunes and on the rocky plains. In each ecological zone, one or more sites were tested intensively to see how much datable information could be gained within a short period of time (Sandelowsky 1974, Sandelowsky 1975, Seeley and Sandelowsky 1974, Sandelowsky and Pendleton 1970).

As the Mirribib Hill Shelter (plate 1) on the plains of the central Namib proved to be the most promising site, work was concentrated there. In this large rock shelter, the archaeological deposit, which covers a time period of over 8000 years, contains six different layers of material.

The sediments in the shelter were analysed against the background of present day geology and geomorphology of the surroundings. Organic material which is well preserved was likewise studied against the background of a modern survey. The remains of owl pellets were found in all layers. Modern owl pellets were studied and compared with the archaeological material. A new approach was tested in the treatment of the archeo-botanical material. Nara (Acacia depressa) seed-coats were found throughout the deposit, and this, together with the fact that Topnaar Hotentots living along the Kuiseb River today utilise this plant, gave rise to an ethnobotanical study.

No human bone was found in the excavation. The only indication of the physical type living in this area in pre-European times comes from a grave site some 30 km away from the shelter. From an analysis of different kinds of evidence, a rhythm of climatic changes over the last 8000-10,000 years will be documented in the following report. Inferences will be made about the subsistence economy of the people living there during that time period.

2 RECONNAISSANCE WORK

Before research concentrated on the excavation at the Mirribib Hill Shelter reconnaissance work was done in all three regional units of the central Namib Desert (Logan 1969) as well as along the valleys of
Map 1: Central Namib, S.W.A.
the Kuiseb and the Swakop Rivers. These two stream-beds are usually dry on the surface but their underground water supply supports a vegetation and concomitant animal life likening these areas to longitudinal oases. For parts of their courses these river-beds form impressive boundaries between the Namib platform and the dune Namib (plate 2). The Namib platform is an erosional surface of extreme flatness cut by a few stream valleys and interrupted by widely scattered inselberge while the dune Namib is a vast sand sea. The third regional variant is the coastal Namib, an area of strongly marine climate (map 1).

In each of these areas, environmental conditions are determined by the amount of rain, earth resources, temperature and wind. The lowest temperatures are experienced along the coast, where humidity occurs primarily in the form of fog. As one moves inland, rainfall starts to occur and the 200 mm isolinie runs approximately parallel to the 500 m contour on the edge of the escarpment (Appendix 1). It is over the central Namib that the winter and the summer rainfall areas merge. This was one of the reasons for founding the Research Institute at this location. In addition it marks the boundary between the fog belt and the inland rainfall area as well as a situation where three contrasting environmental zones converge, namely the dune field, the rocky plain and the oasis-like Kuiseb River.

Although Mirabib is seen in perspective with all the other archaeological sites, it was not possible to devote similar attention to other sites. The wider theoretical framework of this project does, however, envisage controlled comparisons with sites in the adjacent areas. Initially sites were sought which might contain evidence of environmental conditions during the Quaternary. Finds of stone tools from every part of the Stone Age calendar have been reported from the Namib. But as is the case wherever there are too few archaeologists to visit, let alone excavate the known sites, all the finds came from the surface.

An excellent opportunity to observe the levels below the surface came when the Department of Water Affairs, putting down a water pipeline from the Kuiseb River to the Rössing Uranium Mine, excavated a trench 60 km long and 2 m deep, in which a beach terrace was found (plate 3). The profile described below by Dr. H. Scholz, a pedologist, is situated approximately 9 km east of the Atlantic, behind the coastal dunes between Walvis Bay and Swakopmund, and approximately 2 km north of the Walvis Bay/Gemsbok road (14°57' E longitude 22°57' S latitude).
21. Description of the section with marine shells

0—5 cm: loose aeolian sand, with grit and small stones which have accumulated on the surface as a result of deflation.

5—100 cm: gypsum ochre-brown grit, consisting of physically weathered granite, has been cemented to form a hard crust. It becomes less well compacted toward the base, where very small (diameter 2—5 mm) gypsum crystals; sometimes forming desert roses, are found.

100—140 cm: buried indurated beach terrace, well enriched with shell remains, whose breaks give the horizon a white appearance. The material that cemented them together ranges in colour from ochre brown to light brown. This horizon also contains large, well-rounded gravels (up to 20 cm in diameter), consisting mainly of quartz, quartzite and metamorphic rock.

140—160 cm: very coherent, reddish brown sand, with cross-bedding impregnated with reddish iron solution along some of the layers. This material does not contain the round gravels and the shells.

160—185 cm: yellowish-brown, silty sands with well-layered horizontal bedding. Due to a high content of the silt constituents, this material is more coherent and baked together.

185—250 cm: less coherent sand. Bedding is visible due to reddish iron precipitations. In these sediments, layers of gypsum concretions are found up to 5 cm thick. Often they are also along vertically-running, old mud cracks and other fissures. Some could
well be root casts. The lower two horizons most probably represent delta sediments of the Kuiseb. Shells from the 100 - 140 cm horizon were submitted to A. J. Tankard of the South African Museum in Cape Town for identification. They are all marine oyster shells, probably *Swartrystea marginata*. Their robust nature suggests turbulent conditions. This oyster, which inhabits shallow water, is a warm water species not found on the west coast at present. Pieces of rock with bored holes, found together with the shells and waterworn cobbles, are mud stones that have been bored by animals. Some mullions are capable of doing this (Tankard pers. comm.).

Most probably this bench terrace is a Pleistocene phenomenon. The silty material, the cross-bedded reddish brown sand and the shells indicate specific environmental conditions which it would be most interesting to compare with the present situation. The presence of the warm water oyster implies far-reaching climatic changes. Warmer water along the coast could have been related to more rainfall on the land. Silt deposits in this profile, as well as those that can be observed on the banks of the Kuiseb River further inland, may have been related to more surface water in the river-bed as a result of this higher rainfall. The two horizons containing silt are divided by the layer of windblown sand, and aeolian material overlies the shell-bearing bench terrace. A rhythmic pattern of change from dry, windy conditions to wetter, milder conditions could be inferred from these deposits. It is now of vital importance to discover the dates for these changes.

### 2.2 Archaeological sites along the coast

Fresh water can be found along the dune coast of the Namib, where forelands protrude seawards from the otherwise straight north-south trending coastline. It has been suggested that these forelands have developed from the drowning of estuaries existing when inland rivers were able to reach the coast. This process of drowning is evident today in progression of foreland development from Moob Bay, through Conception Bay and Sandvis, to Walvis Bay (Sealy 1979:23, Bremner pers. comm.). Cultural remains, usually in the form of shell middens, were found in the vicinity of all these fresh water sources occurring near the forelands along the Namib coast.

South of Walvis Bay, in an area known as Wortel, (14°29' E, 23°6' S) dune sand is interspersed with, and overlies layers of silt deposited by the Kuiseb River. It is hard to tell the age of these silt layers because the Kuiseb has probably not reached the sea since 1934. Nor is it known which course it then took, winding through the dunes as it must have done. In three areas near Wortel, interesting finds were made.

In the area closest to the coast there was the smallest amount of glass, porcelain and plastic. There was an abundance of pottery, ostrich egg shell, both worked and unworked, and animal bone. This range from fish bone to large bovid. Not far from here, there is an old silt layer, several metres in extent, on which the tracks of a variety of animals are clearly imprinted. Many of these are foreign to the area today, some of them not readily identifiable. Similar evidence has been recorded in other parts of the Namib (Wand 1975, Sandelowsky, Scholtz and Ahlert 1976). Human skeletal remains were also observed in this vicinity by Mr Willie Knowles, Division of Nature Conservation (pers. comm.). Some of these were recovered, but the skull and the long bones could no longer be found. These bones were embedded in dune sand, which also contained minute potsherds and fragments of clam shell.

South-east of Walvis Bay, in a similar context of dune sand and silt deposits there is a large concentration of human skeletal material (14°32' E, 22°59' S). Much of this may be part of a recent graveyard. Here some disturbance has taken place. Erosion has exposed the material and people, dogs or jackals may have been at work. Where intact bodies are uncovered they look mummified, which is not surprising under these environmental conditions. Objects ranging from old bottles to ostrich eggshell beads were found in association with these graves. In the late forties, similar items were seen in a non-White graveyard at Swakopmund (personal observation).

A systematic archaeological investigation of these sites, correlated with historical and ecological research, would contribute significant information to the history of the Kuiseb delta.

Shallow seismic work has shown that the Kuiseb probably reached the sea at Sandvis. Two distinct channels were located in the bedrock beneath the nearby dunes while brackish water was found seeping through the foreshore at Sandvis at low tide (Hollwig pers. comm.). Consequently the river's course has been deflected to the north by the sand dunes encroaching upon its diminishing surface flow during the present interglacial. The subterranean flow of fresh water at Sandvis gives rise to sedge and reed vegetation. A variety of birds breed here. Seabirds, jackals and smaller mammals would have provided a further source of food for prehistoric inhabitants. The deteriorating ecological situation at Sandvis is being monitored by scientific teams. The vegetation is receding, the bird populations are decreasing and species of invertebrates are disappearing. A deserted wooden house, together with the remnants of a stone house, mark the site of the last permanent resident of Sandvis.

About 200 m south of the last of these structures, on the edge of the Sandvis dune, (14°30' E, 23°26' S) there is a small scatter of white clam shells, fragments of glass and chipped quartz cobbles. About 1 km south of here Inara bushes (*Acathosia* horrida) gradually cover the low sand dunes.
at the base of the tallest plant, a concentration of copper fragments, pieces of iron and glass in different colours (green, brown and violet), chipped stone, bone and shell fragments was noted. From here the three plants extend eastward into a dune valley at the head of which is a fresh water seepage which the rusted blade of a shovel lies amongst a scatter of bone fragments, tura seed-coats and two large, beak-like metal objects: A midden of small, sore clam shells was located in another dune valley, to the north west. Near plants grow high up along the steep sides of the dune wall of this valley, the floor of which is mossy and supporting a patch of Plantago lanceolata. There are traces of ash and charcoal, a few split pebbles and potsherds, partially exposed. One of these sherd shows an unusual decorative feature consisting of ripples in two circles.

Typically the archeological material from Conception Bay resembles that from Sandies and Walvis Bay.

Within a few hundred metres of the Conception Bay waterhole (14°32'E, 23°56'S) concentrations of middens material were found. Different types of shell were concentrated on individual middens. This consists of shell middens, each having two shell heaps, separated by a distance of only a few hundred metres, containing black mussel shells in the one case, and soft white clam shells in the other case. Other than that, a similar collection of artefacts could be found at all the sites: potsherds, ostrich egg shell, copper beads and coins, stone flakes, chips and hammering stones, as well as fair quantities of bone. One human skull and an almost complete post-cranial skeleton crouching on the surface were collected. Fire places were indicated by concentrations of ash and charcoal, as well as bits of burnt bone. Dr John Vogel, a member of our expedition, collected the sherds of one clay pot with the characteristic curvature and lot adhering to its base. As well as reconstructing the pot, he dated the site to approximately 1300 A.D. (Vogel pers. comm.). This is one of the few C14 dates available for shell middens along the Namib coast (Slijper 1973, Wendt 1975).

One site in the Conception Bay area does not belong to the shell midden type of site. This is a scatter of stone tools lying on a thin layer of coarse white sand covering very fine, red, silty material. None of these implements resembles the crudely chipped pieces found on the shell middens. Whereas most midden implements are made of the commonly available white quartz, most of those on the site just mentioned are made of fine-grained silicous material. Triangular flakes and blades are between 1 cm and 8 cm long with well-defined striking platforms and dorsal patterns consisting of three or four converging scars.

South along the coast the next source of fresh water is at Meeb Bay (14°40'E, 24°31'S). This coastal forland, which is even less well-defined than Conception Bay, probably represents the estuary of the ancient Tsachab, which today ends at Sossus Vlei where it is blocked by 300 m high dunes. Fieldwork was done at Meeb in 1968 (Sandelowsky and Pendleton 1970) and it will suffice to mention that the character of the shell midden material here resembles that of the shell middens further north; the stones are marked by crude chipping and rarely show retouch or signs of careful workmanship. Beach cobbles and pebbles often show pecking marks and/or chopper-like edges. The working of ostrich egg-shell is limited to beads or pendants. Engraved ostrich egg-shell is conspicuously absent. It would be interesting to study the variable accumulations of different species of shell found on the middens. It was recently discovered that a shell previously identified as Ostrea alerteronii (Sandelowsky and Pendleton 1970: 50) is in fact another species (Kelsey pers. comm.) i.e. Hinnites sp. which has not yet been described.

The stretch of coast between the Black Rocks, south of Meeb Bay and Spencer Bay was not visited because the area cannot be traversed by motor vehicle. But the area between Lüderitz and Spencer Bay was visited. Here too, there are shell middens, in which some of the cultural material differs from that found further north.

At Diaz Point (15°10'E, 26°39'S) east of Lüderitz, a small accumulation of shell was found close to a large rock which could provide shelter for one or two people. This is an area frequented by tourists and any diagnostic artefacts that may have been on the surface were most probably collected long ago. Most of the shells were limpets but there were also some mussels and snails.

North of Lüderitz and east of Agate beech (15°17'E, 26°37'S), there are large midden accumulations that are fairly undisturbed, being within the diamond area which may be entered only with a special permit. In contrast to the roughly-made stone tools found along the northern coast, well-made microliths of agate and chert were found here.

Anichab, (15°2'E, 26°18'S) north of Lüderitz, is another place marked by a number of fresh water waterholes, in the vicinity of which were scattered midden material. They appear to be only surface scatterers and do not form heaps. A considerable range of stone tools was found in association with these shells: high backed chert scrapers, quartzite flakes and a quartzite cobble with two diles. In addition to a few bone fragments, worked and unworked ostrich egg-shell fragments were found here.

At Saddle Hill (14°56'E, 25°33'S), another source of fresh water and the site of an abandoned mining camp, more archaeological material was found. Between the largest concentration of houses and garages and the coast, material scattered on the surface consisted of copper fragments, roughly chipped stones, ostrich egg-shell fragments with engravings, black mussel, limpets, and whelk shells. There were no potsherds. Engraved ostrich egg-shell fragments had not been seen along the northern part of the coast. The
shells were in good condition and, together with the metal fragments, gave the impression that this occurrence was of a recent date.

This differed from the impression given by another scatter of artefactual material no further than 300 metres away. Here the seashell was highly fragmented and the stone artefacts of siliciclastic material were well worked and reworked. Potsherds were not seen. Stone implements resembling the ones just mentioned, i.e. agate and chert scrapers, were also found on sites of stones which had been sifted for diamonds. Obviously this implements would be out of their proper archaeological context, but their presence on the sifted piles indicates that their manufacture predates mining activities of the early part of this century. Mounds of shell midden material with ash extending down to a depth of at least 15 cm occur amongst the deserted buildings in the vicinity of the windmill at Saddle Hill main camp. There was a mixture of shells: black mussel, barnacle, white clam shell and limpets. There were also potsherds, ostrich egg-shell beads, fragments and roughly chipped quartz cobbles. The occurrence of this material across the paths of one mining building to the next resembled the situation at Conception and raises the question of how the midden are related to the mining structures. It is hard to believe that miners would have ignored pottery and human skeletal material completely, or even have taken pains to avoid the destruction walking over it would cause. The material may have been covered by sand at the time of the mining operation, or, indeed, postdate them.

Spencer Bay was the only place on the route taken along the coast where no archaeological material was noticed in the vicinity of a source of fresh water. Though odd, this does not necessarily imply total absence of sites since, due to lack of available time, the search was not intensive and patches of vegetation covered parts of the valley.

No typical shell midden material was found at Neerloshoek, a short distance further north, where there is yet another fresh-water seepage. Large, well-made stone implements were, however, found on the top of a hill of gneiss with a basic dyke (14°51' E, 25°41' S). This was obviously the source of the raw material, a brown chert. Triangular flakes had well-defined striking platforms, while a large, rounded end-scaper made on a flake showed regular retouch scars.

The finds from the coastal sites seem to represent at least two types of archaeological material. Large, well-made stone tools which were found at Conception Bay and at Neerloshoek show Middle Stone Age characteristics, while microlithic Later Stone Age material is found on shell midden at the other sites. In the shell midden material found along the northern stretches of the coast and in the southern part, differences are apparent in the working of ostrich egg-shell, as well as in the type of stone implements. At Saddle Hill both types of midden material are found (table 1).

2.3 Archaeological sites in the dunes

Finds of large bifaces, flakes and blades have been reported by many of the people who had the opportunity to travel through the dune field or along its edges. Zur Strassen describes the following site in the vicinity of Sossus Vlei (15°40' E, 24°55' S): North of the Tsauchab River on the farm Seren, high shifting sand dunes encroach upon the gravel plain on which dolomite and black limestone materials occur. Amongst the dunes bordering the plain, there is an elongated valley approximately 1 km long, surrounded by sand dunes 30–40 m high. In the lowest part of the valley there are soft, red sandstone formations resembling small inselbergs. These are possibly cemented dune sands which may have been temporarily uncovered by shifting sand. These formations, each sloping gently to the west but dropping steeply on their eastern side, cover an area of ± 200–400 m. Stone artefacts were found on the surface of the exposed formations, as well as on the gravel flats surrounding them.

A surface collection of approximately 60 artefacts was made, only well-shaped, large tools being selected. No microlithic material was found. The implements collected range from large picks and core axes made from cobbles, to carefully-worked lanceolate bifaces and unretouched points (plates 4 and 5).

Similar tools were found in dune valleys south of Hobom (15°13' E, 25°39' S) (plate 6) as well as west of Tsobamb Vitel at a weather station, Naranieb, (14°56' E, 25°51' S), south of Gebabeb (plate 7). Their vertical and horizontal distribution was tested in relation to the geomorphological features of the site (Seely and Sandelowsky 1974). It was suggested that this site may represent a site situation similar to the one presently in evidence at Tsobamb Vitel, further east. Assuming that rivers, today blocked by dunes on the eastern edge of the Namib, penetrated further southwards during times of more rainfall in their catchment areas, the Early Stone Age tools found at Naranieb give an approximate indication of the time at which the Tsobamb may have reached that point of regression.

Accordingly the absence of Later Stone Age tools in the dune area of the Namib could imply that deteriorating desertic conditions since Early Stone Age times prevented people from inhabiting the area. In search of organic material which might date the change of climate conditions more accurately, Seely discovered fresh-water small shells in the trough of the ancient Tsobamb, some 10 km east of the present vlei (15°30' E, 23°55' S).

They were found to originate in layers of mud that are intercalated with layers of dune sand. In the attempt to trace a datable sample of shells to one particular mud layer, Vogel found the footprints of a bird on the surface of a polygonal mud layer which had been covered by sand and mud. As a result of this encouraging find, a search for footprints and shells was taken up (Sandelowsky, Scholz and Ahlert 1978), culminating in the uncovering of a
Plate 4: Early and Middle Stone Age tools found near Sraxia: a) diabase cleaver, b) quartzite cleaver, c) quartzite chopper, d), e), and f) quartzite pebbles

Photo: H. zur Strassen
Plate 5: Early and Middle Stone Age tools found near Sorriem; a) quartzite lanceolate, b) quartzite core-axe, c), d) and h) diabase points; e), f) and g) diabase blades
Plate 6: Handaxes found in the dunes south of Khorixas.

Plate 7: Residue of river silt in the dunes at Namibe.
most curious set of tracks. To date no zoologist, botanist, geologist nor archaeologist has advanced a feasible explanation of their origin. Although small shells were not found in direct association with these prints, a sample was collected from a layer closely related to this one at a depth of 50 cm below the surface. The remains of a Tenebrionid beetle, *Gyrinus orbiculatus*, were found within 5 m from the tracks (plate 8), 50 cm below the surface.

Today these beetles are found on the gravel plains of the southern Namib and not in the dune area. Since they stay near the surface, their remains at a depth of half a metre represent fossil dating to the time of deposition (Endroedy, pers. comm.). Besides providing potential material for dating, they show how well organic material can be preserved here.

A core with three flakes fitting to it (plate 9) was found some 30 m from the site of the tracks. From the size of the flakes and their workmanship, a Middle Stone Age or not Early Stone Age date can be inferred for this find. The fact that the four pieces which fit together were found within a radius of no more than 3 m shows that there has been no disturbance of this material for over 50 000 years, if not 100 000 years.

The densest eastward occurrence of lana bushes gave rise to the name Lana Valley (14°57' E, 23°33' S) which is in the dunes west of the Namib Desert Research Institute.

Large cores, flakes, choppers and blades can be found in patches all along the floor of this valley. Frequent visits over a period of three years revealed how the sand, put into motion by the prevailing winds from either the south-west or the east, periodically covered or uncovered these sites. A similar observation was made at the Soutriver dune site (15°40' E, 22°32' S), situated on the slope of a dune within sight of the Research Institute (plate 10) (Sandelsowsky 1976).

The presence of Middle Stone Age and Early Stone Age material in the dune area, and the conspicuous absence of Later Stone Age finds, constitute important evidence for the age of the sand dunes and related climatic conditions. The projects which these finds suggest are difficult and would take a long time to complete.
2.4 Archaeological sites on the gravel plains

The most distinctive sites on the gravel plains are those found in rock shelters, and those consisting of arrangements of large stones.

The Mirabib Shelter (23°27' S, 15°19' E) was the most promising one of these sites, and the bulk of this report deals with the finds made there.

Two large shelters on the side of the Mirabib Mountain seem to contain similar cultural material, although the deposit appears less deep. Another shelter with white rock paintings of a zebra, a springbok, an elephant and a rhinoceros is situated near the top of Turmsberg. Unfortunately the deposit has been badly disturbed.

At Amrichch (15°52' E, 23°10' S), east of the Heinrichsberg, water is available in rock pools for a few weeks after every rain. At the foot of the small granite hills, three rock formations of different shape and size were observed. A grinding stone with a pestle resting on it was found near the edge of the largest circular formation. Another grinding stone was found inside a small, east-facing shelter on the side of the hill. A lugger was found amongst some undecorated bodyshields at the foot of the hill below this shelter.

A granite outcrop with exfoliating circular boulders and hollows is a feature of the landscape at Garab (15°33' E, 23°06' S), another waterhole. Artefacts of quartz and indurated shale, worked ostrich eggshell and polishes were found all over this outcrop wherever the rocks provide shelter from the sun or prevailing wind. Many of the artefacts can be found in the paths of water driblets which form even with very little rain. No cultural deposit of any significant depth could be located.

Ubib Vlei (15°08' E, 26°06' S) is a salt pan near the convergence of the Uspass and Gamsberg roads. Here two types of stone structures were observed. Round enclosures are built of schist slabs, dioritic rocks and quartz. One circular stone wall, up to a
metro in height and incorporating a stationary boulder, had a diameter of approximately 5 m. Nowhere in the wall was there an opening which might have served as entrance, nor were remains of other building materials such as poles or thatching noticed. Isolated stone flakes were the only archaeological artifacts seen on the surface. Other than that, the remains of tin cans and fragments of glass, presumably from beer bottles, litter the area. It is commonly suggested that these structures were erected during European times in the course of mining activities or war, but no definite evidence is available for these assumptions. This is particularly remarkable since most of the known buildings erected at that time are square and have been declared monuments, mapped and marked.

The other type of stone arrangement at Ubib Vlei is less spectacular and is found as an addition to the natural rock formation. This consists of short rows or low walls of rock built at right angles to the wall of an overhang. In one case the overhang was less than 2 m high. The little compartments that are formed by these small rows of rocks are hardly 1,5 m in diameter. A tall man would not be able to lie down comfortably in any of them. The surfaces are often uneven and rocky.

Two more stone circles and a stone cairn were found on the side of a steep valley leading to the waterhole, Groot Tintak (15°24' E, 22°50' S).

Close to the border of Game Reserve No. 3 and the farm, Ruimte (15°38' E, 22°07' S), more shelters were located. A grinding stone with two parallel oblong depressions in which the pestles still rested, was found at the entrance of one shelter. Poachers with distinctive designs, as well as fragments of a clay pipe, were collected on the talus of another shelter further up the side of the same hill. A complete clay pot was found amongst some granite boulders in this vicinity.

2.5 Archaeological sites on the escarpment

Two clay pots of similar design were recovered from rock overhang situated in mica schist formations on the farm Berghof (15°58' E, 23°21' S). Approximately 10 km from the farm house there is a spring, known as Kowloonie. Near it there are numerous gallery-like overhangs. Poachers and flakes can be found in some of them, but nowhere was a cultural deposit of any significant depth observed.

On the neighbouring farm, Claussieh (16°04' E, 23°23' S), there is a large rock shelter with paintings in various shades of red and white, some very well preserved, others hardly visible. Animal and human figures are represented in a naturalistic style. The deposit is at least 50 cm deep, but it has been badly disturbed in several places. Rocks were lying in a row along the dipeline. At the one end of this passage-like shelter, which is 2-3 m deep where it affords most shelter, there is a circular stone enclosure with a diameter of approximately 0,5 m.

A large shelter with well-preserved rock paintings and organic material in the deposit is situated on the farm Onasis (15°42' E, 22°32' S). One other gallery-like shelter, with small paintings in red colour, was found on the farm Naas (17°10' E, 23°10' S) on the highland beyond the Gemsberg. Across a small river valley from this site, another mica schist overhang contains ash, cultural deposit with decorated potsherds and stone artefacts eroding out on the talus.

2.6 Archaeological sites along rivers

Overhangs of mica schist mark the Kuiseb Canyon (15°16' E, 23°36' S) and are common along the banks of the tributaries of the Kuiseb. One of these overhangs is marked by a prominent structure of stone, holding up a dry tree trunk approximately 2 m high. Four other piles of stone form a row along the wall of the shelter. About 2 km further along on the left bank of the same drainage, a well-constructed wall of flat mica schist slabs just cast at a right angle to the back wall of the shelter. This wall is about 1,5 m high and 2,5 m long. There were no signs of artefacts or fire places.

On the banks of the Kuiseb and Swakop rivers, settlement sites were observed which, abandoned today, still have indigenous names. Topknot inhabitants along the Kuiseb and Colouradas along the Swakop recall when these were last used. There are other nameless sites which are not known to present day inhabitants. They are marked by stone circles, dung accumulations as left behind by animals in kraals, grinding stones, chipped stone, fragments of worked metal and wood. Stone cairns, isolated or in groups of up to eight, are found on the banks of the Kuiseb River and its tributaries. Near the northern bank of the Kuiseb River one such cairn was excavated and found to cover a human skeleton.

Early in 1974 two assistants from the nearby Garob Mine came across one of the stone cairns on the gravel plain just above the Kuiseb Canyon, east of Honeeb (15°17' E, 23°36' S). They dismantled the usual stone structure until they found some bone, at which point I was called in (plate II).

The bones were not buried beneath the natural surface of the surrounding plain and were partially resting against the large mica schist slabs (plate 12) which formed the dome-shaped grave, topped with white quartz cobbles. One of the rocks had probably slipped and crushed part of the skull after burial. Fine windblown sand covered the bones. The skeletal remains, recovered in the course of systematic excavation, were incomplete. The bones which were recovered were in a very friable condition. Some were treated with a mixture of glycel and
Plate 11: Gorob grave cairn

Plate 12: Skeleton found beneath Gorob grave cairn
skeleton and in the laboratory 'Kraul Fixative' was sprayed onto some of them. No grave goods were found.

One of the bones was submitted to the CSIR Radio Carbon Laboratory and was found to be 715 ± 75 (PTA 1544) years old, thus dating to approximately A.D. 1335.

The remainder of the skeleton was submitted to Prof. de Villiers of the University of the Witwatersrand for analysis (Appendix III).

She suggests that the individual represented by these remains may have been a member of the Bergdama population (Bergdama or Damara).

In 1876 Palgrave found 150—200 people in the Walvis Bay area, including Bergdama and Bushmen. In 1883, 600 to 700 Topnaar and 100 to 200 Bergdamara are mentioned in a report which also states that the Bergdama were the slaves of the Topnaar (Köhler 1965: 115). The relationship of the Topnaar and the Bergdamas has been discussed by Hoorntje (1925: 17), who observed a master-servant relationship which led to intermixture in historical times. Assuming that invaders usually subjugate the local inhabitants, it is possible that the Bergdama were native to this area before the time of the Topnaar. More work will have to be done before it can be said whether the Later Stone Age features occurring on the gravel plains can be attributed to the Bergdama as well.

### 2.7 Conclusion

When tabulated (Table 1) a classification of the sites located in the course of reconnaissance work shows a pattern. Shell middens are found along the coast. The differences noticed between the midden material from the northern and the southern parts of the coast may be due to age but this will have to be investigated more carefully. The relative absence of material predating the Later Stone Age sites along the coast could be due to changes in the coastline since the Pleistocene.

| TABLE 1: Summary of finds made in the Namib Desert |
| SITE |
| Coastal sites | E.S.A. | M.S.A. | L.S.A. | Middens | Structures |
| Wortel | × | | | | x |
| Walvis Bay graves | | | | | x |
| Sandis | | | | | x |
| Conception Bay | | | | | x |
| Mombay | | | | | x |
| Diaz Point | | | | | x |
| Agate Beach east | | | | | × |
| Amichab | | | | | × |
| Saddle Hill | | | | | × |
| Northerns | | | | | x |

| Dunes |
| Scab | | | | | x |
| Horns | | | | | x |
| Narabals | | | | | x |
| Teonduaba Tracks | | | | | x |
| Numa Valley | | | | | x |
| Southwold | | | | | x |

| Plains and escarpment |
| Mirahib | | | | | x |
| Reserve Border | | | | | × |
| Onanis | | | | | × |
| Bergmot | | | | | × |
| Chausab | | | | | × |
| Nours | | | | | × |
| Amichab | | | | | × |
| Tumas | | | | | × |
| Ganab | | | | | × |
| Ubib Vley | | | | | × |
| Tinkas | | | | | × |

| Rivers |
| Kunoeb Canyon | | | | | × |
| Swakop River | | | | | × |
| Gorob grave | | | | | × |

In the dune area the presence of Early Stone Age and Middle Stone Age material and the absence of Later Stone Age material is striking. It suggests that the utterly inhospitable conditions of the central Namib sand sea are younger than these tools. The wealth of Later Stone Age material on the gravel plains and the escarpment indicates that people concentrated in these areas during the Holocene.
3 THE MIRABIB HILL SHELTER

On some maps Mirabib is indicated as Anachankarib. On others it is spelt Mirribib or Mirribeb. In the language of the local Tepaar-Hottentots it is pronounced with an initial dental click and is said to mean 'the place where the hyena sleeps'.

3.1 The ecological setting of the study area

The Namib belongs to a part of the African continent which has been geologically very stable (Martin 1961), and it is assumed that the basic geomorphological features have remained the same during the Holocene, i.e. the period of approximately 10,000 years during which people have been using the Mirabib Hill Rock Shelter.

A pediplain dipping gently down towards the Kuiseb River marks the landscape surrounding the granitic Inselberg, Mirabib. The monotony of this plain is broken only by these relatively high Inselbergs and small, shallow crescent gullies, broader and more deeply incised closer to the Inselbergs, where the gradient is steeper. These gullies become shallower as the distance from their source of origin increases and they usually disappear in the plain. The runoff from the Inselbergs, occurring during the episodic rain showers, does not suffice to join these small drainages to the Kuiseb system. The water seeps into the sediments and soils of the plains as it would during a sheet flood.

The pedology of the plains (Appendix II) is marked by shallow calcareous soils containing a large amount of aeolian sand, particularly close to the surface. Apparently these sands are derived from the dune area south of the Kuiseb, the mica content probably coming from the sediments of the Kuiseb itself. The surface of the soil is covered by a protective layer of stones and grit, consisting mostly of weathered granite, quartz and feldspar. With sufficient precipitation these soils represent the primary location for grasses. The prevailing precipitation prevents a more demanding vegetation. According to the extent of the surface area, the pediplains are the main constituent of this landscape. The pediplains of the Inselberge, the valleys, erosion gullies and undrained depressions, as well as the bare rock surfaces of the Inselberge, are the other elements of this landscape (Appendix II). The most important places for the more developed fauna, such as the mammals, are obviously those where water can collect. Apart from the fact that open water is occasionally available here, the vegetation here is thicker because the water supply is greater. In addition to grasses, dwarf shrubs, halophytes and leafy plants occur at these locations. Even trees grow in the larger valleys. Here the vegetation can survive longer periods of drought, during which the plains are bare of all vegetation. In some of the undrained depressions calcium carbonates settle on the surface. The vegetation in the valleys (e.g. Asteraceae, Acacia vaalvina; A. vitellina; Parkinsonia africana; Boscia hastata; E. albitrunca; Commiphora africanola) provides not only the basis for the more highly developed animal organisms, but is also, through the production of organic matter, the basis for the existence of microorganisms. These are stimulated at the base of the plants by other ecological factors, such as shade and the decrease in temperature.

As against the pediplains, the pediplains represent a drier location for vegetation and consequently produce less plant mass. The soils on these pediplains are generally very shallow, but nevertheless older and younger soil formations can be observed close to each other. The older soils can be 10–15 cm deep and contain calcrites. In some places, well-developed calcarious crusts occur. In contrast, the young soils, which are much shallower, consist of no more than a collection of mostly physically weathered material. Pedologically these are syriones, distinguished on the surface from the older, deeper soils, by the lack of vegetation.

The pediplains of this area do not consist only of weathered material of the local Inselberge. Often a considerable deposition of aeolian material has taken place. In such cases the soils of the pediplains are then deeper, as is reflected by a thicker vegetation. But here, too, the necessary moisture for the growth of trees and shrubs is found only in erosion gullies and valleys.

Within the Inselberge complexes, the least degree of soil development is noticeable. The bare rocks themselves may show only brown discolouration along the cracks and fissures, implying a certain chemical decomposition of iron minerals. Furthermore, the decomposition of the rock is limited to the effects of physical weathering. Expoliation and etchplanation can be observed particularly well. The lobes, at first still sticking to the rock, gradually disintegrate along the edges into ever smaller, scalpelike pieces. Towards the pediplains these rock particles eventually reach the size of gravel and grit. Further transport is usually fluviatile.

Within the Inselberge there are numerous systems of fissures and cracks which provide the primary starting-point for weathering processes. Water penetrates along these, and is here fairly well protected from evaporation. The result is a very localised but intensive soil development, and the creation of favourable plant locations. An increased supply of water which runs off from larger rock surfaces, the shade of the rock overhangs, and the resulting decrease in evaporation all have a positive effect on the growth of plants.

A very striking phenomenon of weathering can be noticed within the Inselberge of the Mirabib area. This is the chemical decomposition of the rock on the shady sides and the undersides of individual rocks and boulders. It manifests itself as a disintegration of the granite and is most probably a chemical type of weathering. This specific type of weathering in particular locations is brought about primarily by the following factors:

a) Water evaporates more slowly in these places and is therefore available as a weathering agent for a longer period of time.

b) The weathering solution, enriched by salts, pro-
notes decisively the hydrophilic disintegration of the rock.

c) The relatively high temperatures speed up the process of weathering.

This geological environment provides a number of resources which are important for human survival. Within the granite there are hollows and holes of considerable size. Here rain water can collect and remain in storage. The granite basement complex is commonly dissected by dykes of pegmatitic and doleritic. These quartz pegmatites provide suitable raw material for stone artefacts. Ochre is found in iron concretions which occur in alluvial deposits and in metamorphic sandstone. Clayey loam suitable for the making of pots, is found in the Kaishe River. Salt occurs in parts and salt marshes, of which there are many in this general area, Southyfer and Ulh Thiel being the best known.

The fauna of the central Namib has been studied by a number of specialists (Bredin 1974, Channing 1975, Hoegstapel and Dixon 1977, Coetzee 1969, Hansel 1977, Stuart 1974, 1975). In 1973/5 Stuart undertook an extensive survey of the mammalian fauna of the Mirabib Hill region (Stuart 1976). Apart from visual observations live-and kill-trapping was undertaken in the granite outcrops, the lower rock screes, the sandy washes and the open drainage. There is a wide range of small mammals including elephant shrews, different species of rats and mice, ground squirrels and gerbils. In a slightly larger size category there is a similar variety of animals ranging from jackals, different kinds of wild cat and hare to aardvark, porcupine and hyena. Then there are steenbok, springbok, gemsbok and zebra. Over twenty reptilian species of snakes, lizards and geckos could have represented the most stable food supply which would have been available even during drought years. Over 40 species of birds have been observed to visit the Mirabib area (Dixons, pers. comm.). Vultures which are also found in this area may have been useful indicators of the whereabouts of carcasses. Then there are birds which have their nests in this area and breed here. Their eggs could have been collected and they could have been hunted or trapped at waterholes. Finally mention must also be made of insects. Roasted focalis are a well-known dish and grubs and larvae are a potential source of protein.

3.2 The excavation

The Mirabib Hill Shelter was formed when a fault eroded in the granite pluton. This fault dips at an angle of approximately 45° to the northwest. Shadow weathering took place along the base of the eroded area, from where weathered material was carried out by external agents such as wind, water, people or animals. The boulders near the front of the shelter have split off, possibly as a result of erosion along the cleavage faces which may have been marked by fissures originally. An area of 50 m from the back wall to the drip line and of more than 15 m across is therefore extremely well-sheltered from the elements and provided a spacious living area for its occupants.

The most striking surface features in this shelter are represented by an extensive dung floor (which is eroding near the drip line), by over 45 upper and lower grinding stones and by accumulations of owl pellet remains (Sendelovskiy 1974). A grid of 1 m² was laid out to cover the floor of the shelter and all the surface features were accurately plotted (fig. 1). A trench 7 m x 2 m was laid out at right angles to the back wall in the centre of the shelter and a trial excavation covering three squares was carried out in 1973 (Sendelovskiy 1974), Where it was impossible to follow the natural stratigraphy the deposit was brushed away in 5 cm levels. Dry sifting through a 5 mm mesh was followed by flotation and washing in water. Compact sections of the dung floor, the basal sand and decomposing layers of granite bed-rock were not treated in this way. Bulk samples were kept.

The trench dug at Mirabib provided a sample of the deposit covering the large living area of this shelter. The greater part of this deposit has not been touched and could provide more information if so required at a later date. In order to maintain the unexcavated material in situ the trench was filled in the following way: the floor of the excavation was covered with 5-10 cm thick layer of river sand from a dry wash approximately 200 m away. The sides of the excavation were then shored up with rubble bricks from a broken down wall at the research station. The trench was then filled up with stones from outside the shelter and another two truck loads of brick rubble and stones from Gobabeb. The excavation was then covered with more river sand and on top of that was spread the sifted residue of the excavated deposit which had been piled up at the entrance of the shelter.

3.2.1 The stratigraphy and radiocarbon dates

The section which has here been described by Scholtz is situated in the centre of the shelter in grid square E where the deposit has the greatest depth (fig. 2). Organic material and charcoal samples for dating were processed and some of them were also collected by Dr J. Vogel of the CSIR Radio Carbon Dating Laboratory in Pretoria.

The deposit in this shelter accumulated under anthropogenic influence. Consequently it is very heterogeneous and does not resemble the structure of a natural profile. The picture is complicated by heavy disconformities of the layers, individual large stones, ash and charcoal concentrations, and accumulations of organic material. On the whole, the mineralogical content has two sources:

a) the granite from the walls of the shelter as the material eroded and
b) outside material transported into the shelter by wind. The bulk of the material consists of this aeolian component which, above the red dune sand, has a grey colour indicating human activity.
The brown-grey, loose sand, slightly gravelly with some stones mixed with a dark, granular weathering material which contains more or less preserved organic remains. This material is loose and the possibility of sediments is greater. An attempt to date this layer was not thought practical.

A charcoal sample was taken from the top of this layer at 35-40 cm depth, in grid square G 35, and was found to be 3210 ± 10 B.P. (PL 1031.)

Another charcoal sample was taken in grid square D 35, where the dark grey layer rests on bed-rock. This gave a date of 8710 ± 10 B.P. (PL 1041.)

A third sample for dating the dark grey layer was taken on grid square J 35, at 50-55 cm depth, where the dark grey layer forms a band between the central sandy layer and the base of red sand. This sample gave a date of 6500 ± 10 B.P. (PL 1047.) Properly the section of this dark grey layer lying as it does on red sand, has been cut and examined by the central sandy layer, thus giving evidence from filling on the surface.

A further sample, taken close to bed-rock (70 cm — bed rock) in grid square H 35, gave a date of 6500 ± 10 B.P. (PL 1056.)

The sample was taken at a point on the front of the shelter, where the deposit was a single thin downwardly parallel to the bed-rock and where the dark grey layer may be trenched out. Further samples are available for dating.

475-80 cm red, very poorly cohesive fine sand, which contains in pebbles and below the red bed-rock. It is free of gravel and contains a small amount of mud. Probably weathering material not having been reworked in any manner to the same sand. No evidence of organic material predominated the deposit at this layer.

85 cm dark grey gravel which is preserved in the original structure. At this layer, the gray gravel bed-rock was very weathered and eroded by gravel.
3.2.2 Sedimentological analysis

Samples from the three layers closest to bed-rock were submitted for chemical and physical analysis (Table 2). In addition five thin sections, representing the four bottom layers i.e. the basal red sand, the dark grey layer, the central sandy layer (two samples), and the vegetation-rich layer, were made (Plate 13 a-e).

3.2.2.1 Chemical and physical analysis

Comparing the particle size distribution in the samples from the three layers, the dark grey layer shows up expected differences. The basal red sand contains the highest concentrations of fine earth and fine sand, probably relating to dry, windy conditions. Both these components recede in the dark grey layer but increase again in the central sandy layer. It is not certain to what the higher amount of coarse and medium sand can be ascribed. The increase of the silt and clay fractions in the dark grey and the central sandy layer is striking. Assuming that these fractions derive from the silt terraces at present situated along the banks of the Kalahari River, it is suggested that the basal red sand precipitates their deposition. Wind which would have transported the coarser sand would also have brought the finer material, had it been available, into the shelter. Once deposited in this particular location it is unlikely that subsequent, weaker wind would have blown this material away again.

In the distribution of net extractable cations there is a similarity between the basal red sand and the central sandy layer. The dark grey layer diverges from what would have been consistent increases or decreases in the various components. A certain degree of such consistency is shown in the distribution of soluble cations. Here the remarkable feature is the sudden sharp increase of all the components above the basal red sand. The difference in this increase between the central sandy layer and the dark grey layer is attributed to the fact that during drier conditions such products of weathering as calcium carbonate, gypsum and lime would have been blown into the shelter together with the greater quantities of sand. The virtual absence of organic substance in the basal red sand is considered to reflect an absence of vegetation cover in the vicinity of the shelter at that time.

The content of charcoal and organic carbon in the dark grey layer is only slightly higher than in the overlying layer, although it appeared to be much richer in these materials. The explanation for these conflicting impressions was provided by the thin sections where the element of fossilisation was recognised here. The results of these two approaches and the initial impression of this layer being interspersed with ash, charcoal and charcoal suggest intensive habitation of the shelter. Accordingly more fire heat could have caused the brittleness characterising the organic remains in the layer.

3.2.2.2 Soil microscopy

The International Soil Museum at Lutshult upon the request of Dr. H. Schulz kindly prepared thin sections of five soil samples taken out of the profile at the Miribel Shelter.

3.2.2.2.1 B 35: sample taken 55-60 cm from the surface (Plate 13 a)

This sample was taken from a pocket in the basal red sand. Mostly it consists of fine, sandy quartz grains, some of which are well-rounded while others are sub-angular. The next most commonly occurring mineral is muscovite appearing in long narrow pieces up to 2 mm in length. There are also opaque mineral grains (ore), tourmaline and mica grains. The material is very poor in clay which lies embedded in between coarser grains. The sample only contains such traces of organic matter as evident from the chemical analysis (Table 2).

3.2.2.2.2 D 35: sample taken 45-55 cm from the surface (Plate 13 b)

This sample which was taken from the dark grey layer consists of rounded grains of quartz, fragments
of muscovite and feldspar. In addition to these minerals which constitute the bulk of the sample there are also larger, angular rock fragments which do not indicate an aeolian origin, but which have become mixed up with the aeolian material. The silt and clay fraction consists mainly of ash. In comparison with the central sandy layer there are also more charcoal remains and more numerous fossilized organic remains.

3.2.2.2.3 E 34: sample taken 24–35 cm from the surface (Plate 13 e)

This sample represents the bulk of the central sandy layer. It is marked by great heterogeneity. The skeleton consists of:

a) grains of quartz, muscovite and feldspar implying an aeolian origin;

b) large angular quartz fragments with a diameter greater than 10 mm;

c) plant remains which can also have a diameter of more than 10 mm;

d) charcoal remains, most of which do not exceed 1 mm in diameter.

Evidently the sediment has been thoroughly mixed by anthropogenic agency. The sample contains less charcoal than that from the dark grey layer and the ash content seems to be smaller as well. The fossilized plant remains are larger and better preserved and the cell structure can be recognised quite well in these dark brown or red brown fragments. The bone fragments seem to have a lighter, yellow colour and the cell structure is not clearly discernible.

3.2.2.4 E 34: sample taken 47–52 cm from the surface (Plate 15 d)

This sample represents a coherent lighter-coloured band within the central sandy layer. It differs from it by larger charcoal fragments and by a higher content of ash in the silt and clay fraction. Organic particles of faunal and floral origin occur to a lesser degree. They are also fossilized.

3.2.2.5 E 35: sample taken 6–15 cm below the surface (Plate 15 e).

This sample was taken from the vegetation-rich layer. It is marked by a very high content of organic material, particularly of very well preserved plant remains. Pieces of charcoal are larger than 1 cm and quartz fragments exceed a diameter of 5 mm. The plant remains show distinct signs of fossilization. On the whole and by comparison with the central sandy layer the aeolian component of sand with its typical fraction is much smaller. Instead there is an increase in the fine fraction of silt and clay. Here too, there seems to have been thorough mixture of the deposit by anthropogenic agency.

3.2.2.3 Conclusion

The results of the sedimentological analysis are interpreted in the following way: the major component of the basal red sand originates in the dunes south of the Kuiseb River. The sand was transported into the shelter during extremely dry, windy conditions such as have not been experienced since. The lack of substantial amounts of organic material as well as of silt and clay implies a virtual absence of vegetation prior to the formation of the silt terraces which are found along the banks of the Kuiseb River today.

The dark grey layer differs from the underlying red sand on account of its organic components and the lower content of aeolian material. This and the high content of ash and charcoal suggest a denser vegetation cover and more intensive human occupation of the shelter. In accordance with this it is probable that the heat of many fires contributed to the fragmentation and looseness of the material in this layer.

Conditions conducive to fossilization prevailed in the dark grey layer as well as in the central sandy layer. Age may be the reason for the material in the vegetation-rich layer not yet being fully fossilized. More aeolian material in the central sandy layer indicates windier conditions and less soil-enveloping plant growth. Such concentrations of ash and charcoal which occur in bands or lenses within the central sandy layer most likely result from more intensive habitation during relatively short periods of more favourable conditions.

The results of the sedimentological analysis suggest that there is scope for intensifying this approach. The pedology of the study area indicates what the potential of the site can be, depending on the rain. With more care the origin of the sediment could be determined more precisely. For example, experiments could be constructed to establish more accurately the relationship between different components of the sediment (e.g., the silt and clay fraction) and their suggested place of origin, e.g., the silt terraces along the Kuiseb.

The number of thin section samples could be increased and studied more carefully. As the typological study of the plant remains progresses it should become possible to identify fossilised organic fragments preserved in the thin sections. Where a lot of organic material has been preserved this could be of crucial importance.
Mirabib—An Archaeological Study

3.2.3 Archaeo-ethno-botany

The reason for studying the plant remains found in the Mirabib Hill Shelter was twofold. Firstly, the botanical data was to provide an additional source of information on paleo-environmental conditions, which were being reconstructed on the basis of faunal and sedimentological evidence. Secondly, there was the hope of finding information on patterns in the subsistence economy of human populations inhabiting this area during the Holocene.

This information is emerging from an ethno-botanical study of the inara (Acathosiceae harada). Seeds of this endemic cacti were found throughout the Mirabib deposit. Ricinus seeds (Ricinus communis) occurred in marked concentrations in the vegetation-rich layer, but have not yet been dealt with in detail, beyond establishing that Ricinus communis was present in this general area much earlier than was believed, and that it does not occur in the immediate vicinity today. Apart from the inara and ricinus seeds, obviously collected by people, it was brought from some distance, the bulk of the plant material is considered to have come from the immediate vicinity of the shelter. This material was studied with the aim of reconstituting the environmental conditions of this area. In this context, it is not considered important that non-human agents might be responsible for the presence of some of the plant remains. Three different approaches were applied in the study of the ethno-botanical evidence, whilst a survey of modern conditions provided comparative data.

The excavated material was analysed quantitatively as well as qualitatively. The qualitative analysis established that material from this excavation was well suited to an anatomical method of identification. Samples taken to test the presence of pollen were mostly sterile. Only the dung floor contained pollen, as yet unidentified (van Zinderen Bakker pers. comm.).

The third approach arose from an observation of the distribution and appearance of inara seed-coats. This led to an ethno-botanical study of the inara plant and its utilisation by the Topners and Hotteetos living along the Kuiseb River, some 40 km from the Mirabib Hill Shelter (Dentlinger 1977).

3.2.3.2 Sampling

The plant material from the central squares in the deposit was chosen for an intensive quantitative and qualitative analysis. The material was processed in excavated units of volume (100 x 100 x 5 cm). To ensure that this was a representative sample, spot checks were made by comparing the weights of units in the sample with those of twelve units from other parts of the excavation. For the final presentation of results, all the units belonging to one layer were added together.

3.2.3.3 Accumulations of plant material

The surface layer of loose, ashy material on top of the dung floor contained the best preserved plant remains. Twigs as long as 20 cm were found, some of them with bark, thorns and leaves.

Below the surface the bulk of the material consisted of fragments of wood, bark, twig and grass leaves less than 5 cm long. A few leaves are preserved but they are brittle and larger ones are usually fragmented. Inara seed coats were interspersed throughout the deposit. Occasionally seed coats mixed with other vegetable material, usually a matted pad of grass, would be concentrated over small areas 5-7 cm in extent. Ricinus seeds were found in more distinctive accumulations in the vegetation-rich layer (plate 14a, b). Two grinding stones and the tip of a large granite stone were embedded in one such a concentration. Whilst no grass or other plant matter was found amongst the ricinus seeds, around them there was matted, grassy material, charred along the edges.

A thin layer of charcoal and grass was also found on top of another concentration of ricinus seeds,
shape and size as the one just described, but without plant matter incorporated into its wall. Its inside surface and the surface on its well-defined, conical edge resembled the conical pit mentioned earlier on. This lower pit was approximately 10 cm to the side of the basket-like one above it. It was also taken out within a plaster cast.

In the central sandy layer only large seeds were found in slightly denser concentrations. The remainder of the plant fragments, consisting of isolated fragments of twigs, wood, bark, leaves, and grass in an excellent state of preservation, were distributed fairly evenly throughout the layer.

The small amount of organic material recovered from the dark grey layer was in a poor state of preservation, charcoal constituting the bulk of the material.

Near the front of the shelter there was a thick layer of well-preserved pieces of charcoal. The concentration was arc-shaped, approximately 80 cm thick at the broadest point and continuing into the unexcavated section of the deposit. This charcoal does not look like the residue of a hearth or cooking pit but suggests rather that a structure of twigs and branches was burnt down. A bushwood endowes comes to mind, but further excavation would be needed to establish this. In both the grid square over which this accumulation extended, the charcoal fragments stuck to the bottom of the second dung floor. The edge of the third and lowest dung floor was charred and may be associated with burning, although the charcoal layer extends through the vegetation-rich layer into the same layer, but did not, however, make contact with the dark grey layer.

Plate 14: Ricinus seeds in the vegetation-rich layer (upper) a grinding stone, lower) seeds found below it

here mingled with seashells. This accumulation was found immediately below the lowest dung floor. Three other concentrations of vegetable matter occurred in association with small pits or hollows. These combinations were found only in the vegetation-rich layer, one of them extending down into the sandy layer. This had a conical shape and dipped down to a depth of approximately 12 cm (Plate 15). It must have been lined or filled with some material which gave its earthen wall a harder texture than that of the surrounding deposit. It could be effectively swept out with a paint brush, but could not be lifted. Consequently it was raised by means of a supporting cast of plaster of Paris. A concentration of rodent bone, ash and gristy vegetable matter inside this pit contrasted with the material in the surrounding deposit.

Immediately below the dung floor layer, extensive concentrations of plant material were found. In one of these, a nest or basket-like structure with a diameter of approximately 10 cm was found. It consisted of plant material cemented together with fine earth and could be picked up out of its surrounding matrix of less firmly matted plant matter. The concentration of vegetable matter extended, almost like a column, deeper into the deposit, and into another nest-like depression or pit of the same

Plate 15: A small pit which could have been used for seed storage
Quantitative analysis

In the laboratory, the contents of every excavation unit were spread out on a tray and sorted into categories of twigs, bark, wood, grass, seeds, leaves, and charcoal. Each of these was weighed. As leaves and grass occurred in such small quantities, it was decided that they should be excluded from the summary of data presented in the table (fig. 3). The variable amount of plant remains found in the different layers corresponds to the volume of the layer as well as to the conditions of preservation. The high percentage of charcoal in the vegetation layer and in the sandy layer obscures the relative occurrence of the other materials. Since most of this charcoal was part of what is thought to be the burnt down structure, the high amount of charcoal creates a false impression. It was therefore decided that the different categories of material should be represented separately as well. The charcoal found in the dark grey layer does, however, represent a significant constituent in the data and must be considered independently. Since unburnt material may have decayed, the charcoal might represent only a part of the total plant material. If the surface layer were taken to represent an average ratio of charcoal to other plant materials, it is possible that the dark grey layer contained a great deal more plant material than any other layer, and much more then is represented by the volume recovered during excavation.

The highest concentration of bark was found in the vegetation layer. Less than half of that amount was found in the sandy layer. The dung floor contained about 3% less bark, and only 21% of the total bark was found in the surface layer, even though preservation was good. The negligible amount of bark recovered from the dark grey layer probably results from poor conditions of preservation. Almost half of all the wood remains came from the dung floor. Ten per cent less wood was found in the vegetation layer, but as such it still contained almost four times as much wood as found in the sandy layer. Again the amount of wood from the dark grey layer was small. The surface layer contained less wood than the dung floor and the vegetation layer, but more than twice as much as the sandy layer.

The amount of twigs recovered from the dung floor and the vegetation layer considerably exceeds the amount from the sandy layer. It also exceeds the amount from the surface layer, though to a lesser extent. There are hardly any twigs preserved in the dark grey layer. The mass for the caches of ruminant seeds in the vegetation layer were not included in the total mass for seeds. The bulk of the remaining seeds, in contrast to the other plant matter, was found in the sandy layer. Slightly fewer seeds

![Diagram a)](image1)

![Diagram b)](image2)
occurred in the vegetation-rich layer, with decreasing amounts occurring in the dung floor, the surface and the dark grey layer. Nara seeds constituted the bulk of all the seeds (Fig. 3). They were separated from the other seeds, showing an interesting ratio to them: in the dung floor only 33.4% of all the seeds were Nara seeds, whereas they represented 99.44% of all seeds in the sandy layer. A similarly high concentration of Nara seeds (98.22%) was found in the vegetation layer and they constituted 42.0% of the seeds in the surface layer. The amount of 97.98% found in the dark grey layer may once more have to be considered in terms of the means of preservation. It is possible that Nara seeds preserve better than other seeds. Considering the variable thickness of the layers, it was decided to compute the percentage of total plant remains found in a single excavation unit from each layer. The frequency of plant material in the six different layers is presented in a table (Fig. 5). There is a high concentration of plant remains in the vegetation-rich and the dark grey layers (43.76% and 23.88%) respectively. The surface layer contained only 11.7% and the sandy layer shows up as a remarkable contrast with only 1.94%. The dung floor contained 18.72%. The dark grey layer is represented exclusively by charcoal, but as such comprised 23.68% of the plant remains collected in the six distinct depositional units. No organic material was found in the deposit of red sand filling hollows in the bed-rock beneath the dark grey layer.

The units used in this comparison were chosen subjectively so as to represent the average or most common situation in each layer. In the vegetation layer, a unit was chosen which did not contain part of a seed cache. In the sandy layer, accumulations of the well-preserved charcoal were avoided. The material representing the dark grey layer comes from the central part of a thick band of the layer.

3.2.3.5 Qualitative analysis

In southern Africa no use has so far been made of archeo-botanical evidence other than pollen in the interpretation of palaeo-climatic data (Sandelowsky 1976). In most areas the conditions are such that it is not standard practice to collect all the plant remains and flotation methods (Higgs and Vila-Tifzi 1968) are seldom applied. It is difficult to have materials identified. At the Botanical Research Institute, where an identification service is officially available, there is a ten year backlog of work. There are not many people with specialized knowledge of the Namib Desert flora, and only 20% of a sample of material submitted for morphological identification at the Botanical Research Institute could be identified. Consequently an attempt was made at identification on the basis of anatomical characteristics.

From the material which had been sorted in preparation for weighing, five units from distinctive strata in the deposit were chosen. Specimens from these units were prepared for micro-analysis. They were weighed collections of twigs and woody fragments were scrutinized with the aid of a microscope and sorted into sub-groups according to such characteristics as small hairs or tissues in the outer surface. From every unit a few pieces of charcoal as well as two or three specimens from every sub-group of twigs and wood were selected for anatomical identification. Although leaves and grass bases were also prepared, with the aim of testing their suitability for the process, only cross-sections through stems and wood were used for this stage of identification.

The method used for microscopic identification was suggested by Roger Ellis of the Botanical Research Institute in Pretoria. He has also provided the following description of the process which led to the identification of the archeo-botanical material from the excavation at Mirabib.

3.2.3.5.1 Choice of reference material

Woody species found growing under present-day conditions within a 50 km radius of the Mirabib Hill Shelter, were chosen for use as reference material for anatomical comparison with the woody plant remains excavated from the shelter. The most important woody species in the plant communities falling within this area were extracted from a phytosociological survey of the Namib Desert Park by Robinson (1977, this volume). Representative material of the ± 40 species thus chosen was removed from authenticated herbarium specimens collected as near as possible to Mirabib. These reference twigs and thin stems were prepared in exactly the same way as the archeo-botanical material, and used to facilitate identification (plate 16).

3.2.3.5.2 Preparation of reference and archeo-botanical material for microscopic examination

Normal plant microtechnique procedures were employed for the preparation of all the material. Segments about 1–2 cm long were cut and gently boiled in water for about one hour. These segments were dehydrated in the following series — methanol, 100% ethanol, n-propanol and u-butanol — 12 hours at each solvent at 0°C. The material was then impregnated and embedded in tissue wax (M. Pl. 56,5°C). Each wax block was trimmed, one end of the embedded segment exposed and then soaked in Nollfix for one to three weeks to soften the tissues. This softened material was then cross-sectioned in a transverse plane with a rotary micro-
from the vents and clerids, all of which were still
enlighted.

32.5.5 Identification of prepared material

The transverse sections of the reference species were photographed at various magnifications. As twins with little secondary xylem pre-dominated in the excavated material, conventional wood structure was of little assistance and thus characters as seen in tangential and radial longitudinal sections were not used.

The photomicrographs of the voucher species were grouped according to shared anatomical characters. It was found that vessel distribution and parenchyma-ray structure was sufficient to place the 42 species into four, manageable groups for final visual comparison with the voucher specimen photographs (plate 16). Thus, eight species displayed radial chains of vessel, such differences as whether the parenchyma rays were multi-, bi-, or unilamellate; the length of the chains of vessels, vessel sizes, and bark structure, especially the presence of mtega canals, were sufficient to distinguish the individual species in this group. (Moringa oleifera, Monocha genistifolia, Hernandia affinis, H. stricta, Ficus cordata, Euphorbia guineensis, Maesa schimii and Bessea foetida). A further 12 species possessed only solitary vessels and were further distinguished by vessel size and structure, ray structure, pit size and characteristics of the primary xylem groups. (Dichrostachys cinerea, Bauera merremioides, Dicoma capensis, Grewia flavescens, Croton graminus, Morinda caraphylacea, Hibiscus adocensis and the Acacia species — albida, grisea, rufescens, eritrea, mellifera and reficiens). A further category showed variable vessel arrangement — either in short radial groups or solitary. Thus, Rhus mactechii has wide vessels, either single or small radial groups and with uniseriate rays, the cells of which are filled with crystals and tannin. Cordia ovalis is similar but with biseriate rays. The Commiphora species — sextile, glacencsens and tirgada — have vessels of variable size and arrangement, but can easily be distinguished by characteristic canals in the bark. Parkinsonia africana has narrow vessels in radial groups or singly with very few parenchyma rays and small, homogenous, fibrous ground tissue. Hernandia modesta and H. eliotiana are both much like H. stricta, but their vessels are either solitary or in shorter radial rows than two to four vessels. Both Euclea undulata and E. pseudoebeus have narrow vessels, either solitary or in short radial groups, without parenchyma rays, but they can be distinguished by the radial chains of protoxylem vessels.

In Galenia africana the vessels are in short radial rows, with conspicuous growth rings each separated by a continuous band of unilamellated parenchyma. Salvadora persica and Tephrosia monophylla both fall into this group but have very little secondary xylem and wide pits. Certain species either have no vessels or the vessels are very narrow and not typical vessels at all. Thus, Ruella dreersfof and Xylopia simplex have long chains of narrow vessels extending into the pith. They both lack radial rays. Cataphractes alexandrae and Phasophyllum spinosum both lack obvious vessels but have numerous well-developed radial parenchyma rays. Petalium lanatum, P. setosum and Macowan heterophy- la have numerous, very narrow, solitary vessels. Kiesera capensis and Tribulus zeyheri possess no secondary xylem.

The results of the anatomical identifications are summarised in the following table. The sample here represented is largely a product of the degree to which material from different layers was preserved, and of the effectiveness of laboratory techniques applied in the course of processing the material. The sample is not statistically representative, consequently no attempt will be made to interpret this table. The following comments are made to explain the origin of the identified material.

The sample from grid square E 34 2 — 10 cm represents material just beyond the edge of the dung floor. It is likely to be contemporaneous with the dung floor.
Plate 16: This section through plant stems showing the cell structures.
TABLE 3: Summary of anatomical identifications

<table>
<thead>
<tr>
<th>Plant species</th>
<th>E34 5-10 cm</th>
<th>E34 10-15 cm</th>
<th>G34 22-30 cm</th>
<th>E34 25-30 cm</th>
<th>E34 45-50 cm</th>
<th>E54 45-50 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia xanthophloea</td>
<td>1</td>
<td></td>
<td>1</td>
<td>4</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>A. crista</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>A. reficiens</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Basileia ferrill</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Cattleya olijiflora</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cordia cyleps</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cordia odii</td>
<td>3</td>
<td></td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dicotryum gramineum</td>
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<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dicoma capensis</td>
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<td></td>
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<tr>
<td>Ficus capensis</td>
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<td>Heracleum suffusum</td>
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<td>H. stricta</td>
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<td>Heliconia elatitae</td>
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<tr>
<td>Homalium crenatum</td>
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<td></td>
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</tr>
<tr>
<td>Justusia affinis</td>
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<td></td>
<td>1</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>P. africana</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P. africana africana</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Phyllostachys sinuosa</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>Rhus multiflora</td>
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<td></td>
<td>1</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>Unidentified</td>
<td>7</td>
<td></td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Unidentified, but identifiable</td>
<td>3</td>
<td></td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
The material from grid square D 34 10—15 cm belongs to the base of the vegetable-rich layer beneath the dung floor.

The sample from C 34 25—30 cm comes from the central sandy layer.

The sample from E 34 25—30 cm represents the lower part of the sandy layer, whilst E 34 45—50 cm constitutes part of the dark grey layer.

A number of plants found in the excavation do not appear on the list of species found in the Mirabib area today. This raises a number of questions to be investigated. How far away from Mirabib do these species occur today? Do they share any characteristics? What can they tell us about conditions in the past?

3.2.3.6 Ethno-botanical study of the Inara

The Inara plays an important role in the economy of the Tognaar people who live in small villages on the northern bank of the Kuiseb River. A separate study was initiated to investigate and describe the utilisation of this plant (Dentlinger 1977).

3.2.3.5.1 The Inara

The most obvious and readily identifiable plant remains in all the layers at Mirabib were the seeds of an endemic cucurbit, the Inara (Acomithosicyos harrida). According to Professor C. H. Bornman of the University of Pretoria, "the seeds make up approximately one third of the volume of the fruit, and when fully ripe contain 20% water. In terms of food value they are by far the richest component of the fruit:

<table>
<thead>
<tr>
<th>%</th>
<th>protein (kjeldal nitrogen x 6.25)</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>fat</td>
<td>29</td>
</tr>
<tr>
<td>%</td>
<td>fibre</td>
<td>58</td>
</tr>
<tr>
<td>%</td>
<td>ash</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>undetermined sugars</td>
<td>4</td>
</tr>
</tbody>
</table>

Trace elements such as zinc, copper and manganese are present, as are macro-elements such as calcium and iron.

The Inara is a highly adapted, endemic plant, growing in loose dune sand (Harr 1975). It can survive extremely dry conditions but requires a little rain for germination. The bushes cover sandy hummocks on the side of dunes. Leaves have turned into thorns and photosynthesis takes place directly through the stems.

3.2.3.6.2 Preservation

The stems, thorns and fruit coats do not preserve well, presumably because they are eaten by animals and are of no use to people. Seeds and seed-coats, however, were found in the excavation and near the Tognaar settlements.

A test on the breakage patterns of the seed-coats was designed to ascertain whether the remains of the Inara in the Mirabib Hill Shelter were the result of human agency.

Remains of Inara seeds from three different locations were studied:

a) material found in the excavation

b) remains of Inara seeds collected from the surface near a house in Southwier village by three people independently (a toddler, an older woman living at Southwier; and myself). The collections were checked against each other to make sure there was no preferential selection of certain types of fragments. Similar proportions of breakage patterns were found in all three lots, and it is therefore assumed that the entire collection is a representative sample.

c) remains of Inara seeds collected from the edge of a large Inara bush in the Kuiseb River valley, with melons at all stages of ripeness.

A preliminary study of different collections indicated three phenomena:

a) different patterns of breakage which were distinguished from one another on the basis of shape and size of the seed-coat

b) different degrees of decay, best described as a flaking away of the seed-coat surface. This latter phenomenon was particularly noticeable in the remains from the various levels of the excavation

c) in some cases where Inara melons were deliberately positioned for study, animals consumed the entire fruit.

3.6.3.5.3 Breakage patterns

In freshly broken seeds two types of edges were distinguished:

a) one showing a straight fracture, very often coinciding with the seam of the seed

b) sometimes the fracture is a rather wide zig-zag at angles to the seam

c) the other is a jagged edge such as could be brought about by the teeth of a small gnawing animal

d) an effect similar to (c) along otherwise straight fractures of very decayed seeds. Under a microscope (10 x magnification), however, the flaking of decay can be distinguished from the gnawing marks of small teeth.
Sizes

Three different sizes of fragment were observed:

a) seeds broken into two halves along the seam of the seed-coat
b) seed-coats not broken along the seam but constituting more than 50% of a half-seed
c) fragments of seed-coats representing less than 25% of the original seed-coat surface.

3.6.3.6.4 Findings

In the material from Southwark and from the excavation, breakage pattern a) and b) accompanied size classes a) and b).

Breakage pattern c) accompanied size class c) in the material from the edge of the Inara bush in the river valley.

It is therefore concluded that human utilisation of Inara seeds is indicated by the following criteria:

a) preservation of seed remains — usually just the seed-coats — occasionally a complete seed
b) 25%-50% of the entire seed-coat surface usually preserved, the most common occurrence being half-seeds, split along the seam
c) the edge of the broken seed-coat charactarised by a straight line of fracture, very often along the seam
d) under a microscope, the difference between a sawn and decayed edges can be distinguished.

In contrast the following features are typical of non-human utilisation of Inara seeds:

a) seeds and seed-coat disappear completely
b) Where remains of the seed-coat do occur they are minute i.e. less than 25% of the entire seed-coat surface
c) Edges of the broken seed-coat are characterised by sawing marks in irregular jagged lines. Breakages along the seam are rare.

3.2.3.7 Conclusion

The work on the archaeological material has led to the development of methodological technique, and has provided information on the variable distribution of plant remains in six distinctive depositional units spanning more than 8000 years.

In recovering plant remains from such a site as Mireb, the process described proved practical. Even the material submerged in water did not suffer and could be handled well in the process of further work in the laboratory as long as two years after excavation. The bulk of the material was worked on in the Namib Desert and never left that dry climate.

Although the results of the quantitative analysis have been approached in three different ways, they show a distinct pattern of change.

In relation to equal parts of volume 43.76% of the plant remains recovered from the six distinct sediments are concentrated in the vegetation-rich layer. Assuming that charcoal indicates the availability or presence of plant material, it is suggested that a similar, if not greater concentration of vegetable matter occurred in the dark grey layer. As it is, charcoal, the only plant material preserved in this layer, constitutes 23.88% of the vegetable remains.

Fairly similar quantities of botanical material are found in the dung floor layer and in the surface layer (18.72% and 11.7% respectively).

By comparison, plant remains are conspicuously rare in the central sandy layer (1.94%) and completely absent in the deposit of red sand occurring in rocky hollows beneath the dark grey layer; it is suggested that this reflects the relative frequency of vegetation in the vicinity of the shelter.

The distribution of seeds in the Mireb deposit supports the impression of alternating dry and moist conditions.

The poor preservation in the dark grey layer does not indicate accurately to what extent Inara are represented in that layer. In all the overlying layers, however, Inara seeds are an important feature (Fig. 3). In the dung floor all seeds decrease, comprising only 6% of all the plant remains, and of these only 33% are Inara seeds. This could well be related to the introduction of sheep when meat became more abundant in the diet, accounting for a decrease in Inara. In the central sandy layer Inara comprise 99.44% of the seeds which in turn constituted 64% of all the plant remains. Similar frequencies were found in the vegetation-rich layer. In the surface layer Inara seeds are once more an important item. Ethnographically the Inara still plays a role in the economy of the stock-owning Topnaar people (Denlinger 1977).

The data from the qualitative analysis should soon be enhanced by additional qualitative evidence. Experiments in the qualitative approach have demonstrated that the method of micro-identification can be applied to archaeobotanical material. Considering the wealth of sites in the Namib Desert alone this technique has considerable potential and can subsequently be applied in botanically more complex areas.

Very little is known about the Inara plant, its conditions of growth and distribution. It is a food plant of considerable nutritional value growing in areas where few other plants survive. A closer study of this plant is certain to provide significant ethnobotanical information.
3.2.4 Stone artefacts and other cultural material

The bulk of the artefactual material consists of microlithic implements made of quartz. Larger stones were used for grinding and hammering. A few fragments of worked wood and knotted grass may be a poor indication of the position of these in the material culture of the inhabitants of Micrab. Bone and hide were probably of similar importance and are represented by a few leather fragments and pieces of worked bone. Isolated fragments of metal and pottery were found close to the surface only (plate 17d, 18c).

On the surface of each of the three granite grinding stones there was a red stain, probably from grinding ochre. A similar colour was noticed on ostrich eggshell fragments, beads, pieces of bone and marine shell. Strands of tightly curled human hair were encrusted with ochre-coloured paste (plate 18a). In one case an ostrich egg-shell bead was attached to the end of a strand of hair. Red colour and in some cases human hair, also adhered to sharp-edged chips of quartz (fig. 4 c, h). These stone fragments were neither well-shaped flakes nor did they show signs of secondary working.

Nodules of haematite or iron ore were found in all the layers. Some of these are soft and can be rubbed to make a reddish colouring matter. Others are too hard. It is possible to melt them, but in the absence of any other signs of metal working in the area, it is unlikely that this was done. Pellets of ochre paste, often with hair, were found at all levels.

3.2.4.1 Sampling

During the process of excavation, the cultural material found in the deposit was put through the first selection and rough sorting. The artefacts were either exposed during the brushing away of the surrounding deposit or picked up when the material was sieved. More careful cleaning and sorting took place in the laboratory. All the non-lithic material was recorded (table 6).

From the huge quantity of lithic material, a sample of almost 4000 artefacts (3922), flakes, cores and retouched implements was chosen for detailed analysis (table 7). This sample represents the four central grid squares of the excavated area, where the deposit reaches its maximum thickness. All of the six sedimentologically distinct layers are represented here.

All recordings were kept separate according to the excavation units. Since the dung floor was the only clearly defined layer, the remaining deposit was removed in 2 cm slices per grid square. The materials from the different units in each layer were compared, and when an internal consistency was observed it was grouped with the other material from each of the six general layers.

3.2.4.2 Stone

3.2.4.2.1 Raw material

Some of the lithic material showed no signs of chipping, grinding or colouration, but was material which would not have occurred naturally in the shelter. Large slabs of muscovite and biotite probably attracted the attention of prehistoric collectors, just as they attract people’s attention today. A number of these pieces show signs of attempted perforation, but none could be described as well made pendants or as having been fashioned into any specific design. A piece of limestone had been bored like a pendant (plate 17c).

Chert nodules, jasper, flint and unworn pieces of fine-grained quartz must have been carried into the shelter and were probably intended as tools. These raw materials, worked and unworked, occurred in all the layers, except in the basal red sand.

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<th>Layers</th>
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<th>Actual numbers</th>
<th>% Within layers</th>
<th>Actual numbers</th>
<th>% Within layers</th>
<th>Actual numbers</th>
<th>% Within layers</th>
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<td>37%</td>
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<td>32</td>
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<td>37%</td>
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<td>17%</td>
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<tr>
<td>% of total type found</td>
<td>16%</td>
<td>10.1%</td>
<td>28</td>
<td>17%</td>
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</tr>
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<td>72%</td>
<td>667</td>
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TABLE 7: Frequencies of stone artefacts in the four central grid squares of the excavation
Figure 1: Dingr floor: a) edge-damaged flake of indurated shale, b) medium-sized scraper of quartz, c) convex scraper of clear quartz, d) broken convex scraper of moss agate, e) flake with traces of ochre made of clear quartz, f) high-backed core scraper on river pebble of clear quartz, g) convex scraper of clear quartz, h) flake with traces of ochre made of clear quartz, i) irregularly shaped flake with retooling, j) convex scraper of clear quartz, k) convex scraper of clear quartz, l) irregularly shaped flake with retooling, m) obliquely convex scraper of clear quartz with traces of dark colour, n) distinctly retouched flake of clear quartz, o) double crescent of agate, p) convex scraper of (pepper, q) crescent of clear quartz, r) crescent of clear quartz.
Figure 5: Vegetation: a) hovel of clear quartz, b) irregularly shaped fragment of liddiated shale with retouch and edge-damaged, c) core of flint, d) blade core of milky quartz on river pebble.
Central sand: e) core of chert, f) blade core of milky quartz on river pebble.
Vegetation: g) blade core of clear quartz, h) core of vein quartz with semi-circular platform.
Dung fibro: i) core of milky quartz with circular platform, j) blade core on clear quartz river pebble.
Dark grey: k) discoid core of vein quartz, l) discoid core of white quartz.
Quartz was the most commonly found raw material, varying in appearance from a clear crystal-like variety and a fine-grained, milky type to semi-transparent vein quartz and a dense white quartz. For the purpose of description the following three categories were set up: 'clear quartz' comprises the crystal-like type and the fine-grained milky pieces; 'vein quartz' is a fine-grained, semi-transparent and prone to uneven fracturing; 'white quartz' is fine-grained and with an even texture, but not transparent.

 Grinding surfaces were found on garnet-hornblendiechant, granite and sandstone slabs (plate 22 a, b). Most of those larger stones blackened by fire and probably used as hearth stones were slabs of granite. A number of smaller, flatter granite spalls were found. These had only one blackened side, and probably exfoliated from the roof of the shelter, which is covered by a black deposit, probably soot. The bulk of microlithic material consisted of chips, chunks and flake fragments, ranging from minute pieces to angular fragments with dimensions of 3 – 5 cm. Unbroken flakes, cores, retouched pieces and those with obvious modification of the edge or surface are described in detail.

32422. Cores

On the surface only a few microliths were found and all of the cores were broken. In the other layers the numbers of cores varied in relation to the quantities of other stone implements. In the vegetation layer 32.2% (133) of all the cores were found. Most cores came from the central sandy layer (187 = 45.3%), while 53 or 12.8% were found in the dark grey layer and only two (0.5%) well-defined cores occurred in the red sand at the base of the excavation although three of the scrapers are made on cores as well. Most of the cores are made of vein quartz and clear quartz (fig. 6 a; fig. 5 c–h; fig. 12 b, d, e).

The size of the cores was recorded by marking the greatest length/breadth measurements on graph paper. Most of the cores were of a medium size with lengths and breadths falling between 20 – 50 mm. Those recorded as being smaller or larger than this are in low numbers and are neither excessively small nor very large but should be seen as forming the two ends of a continuum which has a mode of 25 mm (fig. 6 b).

Flake release scars were counted. The quality of the quartz, which shatters and fractures unevenly, made it impossible to assess the total number of flake scars accurately in every case, but it could be established that the greater percentage of cores had more than five flake scars. Well-worked cores made from small clear quartz river pebbles indicate a good control of this hard raw material (fig. 7 a).

That percentage of the core's surface covered by cortex was estimated and recorded in the following four categories: none, 50% cortex covering and more or less than that. This was thought to indicate a degree of workmanship, but it was observed that clear quartz river pebbles which were well worked would often retain as much as 50% of cortex on the surface.

Consequently it was considered more useful to note the number of cores made on river pebbles (fig. 7 a), most of which were found in the vegetation.
rich layer. In the dark grey layer there is a slight increase of well-worked cores without cortex.

The shapes of negative flake scars on cores are not always clearly discernible because scars superimpose upon one another. Long, narrow blade scars are the most diagnostic ones, usually occurring on cores with two opposing platforms (fig. 7 b). These characteristic scars were observed in similar quantities on all the cores, and relate to the frequencies of blades (fig. 9 a) and retouched tools made on blades. The direction from which flakes were struck off a core was also recorded and from this the number of platforms on a core can be deduced. The most common pattern was that of a single platform core. Often one or two flakes had been removed to create the platform from which subsequent flakes were struck. Cores with two platforms approximately at right angles to each other occurred fairly frequently and merged with discoidal and chopper-like cores with flakes removed from a circular platform (fig. 5 c–I).

There is a striking similarity in the cores from the three central layers i.e. the dung floor, the vegetation-rich layer and the central sandy layer, while those from the dark grey layer deviate slightly from the pattern as regards size and choice of raw material. Although no complete cores were found on the surface, the core fragments and the other stone artefacts resemble those found in the three central layers. The material from the basal red sand provides an obvious contrast.

3.2.4.2.3 Flakes

Flakes constitute 72.5% of all stone implements analysed. The ratio of flakes to cores and modified pieces was very similar in the five main layers (table 4).

Clear quartz and vein quartz are the most commonly used raw materials. There are only isolated specimens in quartzite, while fine-grained siliceous materials occur in small numbers (fig. 8 a).

The size of the flakes was also assessed in terms of large, medium and small, relating to flakes with a length/breadth dimension of larger than 30 mm, between 20 mm and 29 mm and smaller than 20 mm. Like the cores, most flakes are of medium size and there is a continuum of sizes rather than three distinct categories (fig. 8 b).

Four different types of platforms were recorded: the most common being an irregularly end-struck flake. The numbers of side-struck flakes were smaller, but exceeded those of blades. Cornet-struck flakes were an exception (fig. 9 a).

Platforms were mostly plain or were represented by the natural surface of the stone. Faces on the platform were very rare (fig. 9 b). In accordance with the plain and the natural platforms, many flakes showed cortex on the dorsal surface. On more than half of the flakes there were two, three or four scars, which were usually struck from the direction of the platform (fig. 4 c, d, fig. 9 c). Most of the scars were parallel or converging.

Figure 7: Cores: a) frequencies of cores worked on river pebbles, b) platforms.
Figure 8: Flakes: a) raw material, b) size of flakes.
Figure 9: Flakes: a) planform, b) platform, c) dorsal pattern.
The low incidence of tools in the basal red sand and the surface layer. Since this relates to the occurrence of flakes and cores, it is in itself significant end, although the samples are so small, the absence of backing, hafting and ochreous stain in the basal red sand agrees with the general character of the implements found in this stratum, which is very different from the layers overlying it. By comparison, the stone tools on the surface seem to represent a qualitative continuity, but there seems to have been no need for that kind of tool in the greater numbers that were required earlier on. Since the volume of the deposit is an obvious variable in a comparison of this kind, the frequencies were also tested by working out an average occurrence per excavation unit in each layer (fig. 10 b).

The pattern of characteristics remains more or less the same, with a remarkable decrease of stone tools in the dung floor layer and the surface. By far the greatest concentration of lithic material is found in the central sandy layer, with only about half as many tools occurring in the vegetation rich layer, whereas only half of the later quantities were recovered from the dark grey layer. The very small numbers of implements in the basal red sand are seen in perspective with the lack of ash, charcoal and other artifactual material in that layer of the deposit.

In the four central layers (dung floor, vegetation, central sandy and dark grey) where the samples are of a reasonable size, the ratio in which the different types of modification occur is similar.

Figure 11: Retouched and edge-damaged tools: a) frequencies of formal tools, b) shapes of modified pieces.
The shapes of the retouched pieces are remarkably similar in the bulk of the deposit. The obvious contrast occurs in the basal red sand, indicating the absence of the micro lithic element (fig. 12). Three segment-shaped pieces, of which two are retouched and one is backed, were found on the surface, in addition to five irregularly-shaped pieces with various signs of edge modification. These characteristics resemble those found in the underlying material, although they occur in much greater frequency in the material from the layers below the surface (fig. 4, i—k, p, q, r).

The dimensions of length, breadth and thickness are remarkably uniform in the four main layers (fig. 11), the mode for the whole sample being length: 15.0—19.9 mm, breadth: 5.0—9.9 mm, thickness: 1.0—3.5 mm.

As before, material from the surface and the basal red sand represents a striking deviation from this pattern. In all the layers a convex edge was most commonly worked or used. Less than half of the worked edges were straight, and only a small percentage of these edges was concave (fig. 4, 1—c). In most cases the modified edge was situated on one side of the implement. Though much lower, the incidence of bilateral retouch was not uncommon.

A similar percentage of tools in each of the four central layers had been retouched on the distal end.

In every layer with a microlithic component, there were a few specimens which had been worked on the platform. Signs of breakage or usage on the dorsal and ventral surfaces were observed on only a few isolated pieces (fig. 5 c).

The majority of the microliths in the central layers were flakes or flake fragments with scraper retouched on a convex edge. The most striking tool types were a minute segment and the double crescent (fig. 5 o, r; fig. 5 d).

A large and two smaller quartz scrapers and different cores, reminiscent of holo cores, were the diagnostic tools found in the basal red sand (fig. 12 a—e).

3.2.4.2 Formal tools

Wendt devised a classification for stone tools found in South West Africa in 1972 (Wendt 1972: 28—32). Focussing on the material from Mirabib in his categories shows a fairly wide variety of forms (table 5). The most common type is the segment-shaped scraper. Small geometric, backed blades and pointed curved flakes represent the other characteristic tools of the assemblage. A few outsize 'black' scrapers and battered chunks would be classed as medium sized tools. The only microlithic tools were found in the basal red sand.

Figure 11: Retouched and edge-damaged tools: a) length, b) breadth, c) thickness.
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<td>5</td>
<td>1</td>
<td>-</td>
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<td>4</td>
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</tr>
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<td>-</td>
<td>3</td>
<td>6</td>
<td>2</td>
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| VII a ovate lobate  | - | 1 | 2 | - | - | - |
| VII b notched       | ? | 1 | 1 | 10 | 3 | - |

| VII c miscellaneous | 2 | 3 | 17 | 17 | 6 | - |

| medium-sized scrapers | - | 2 | 5 | 2 | - | - |
| battered cobbles      | - | 1 | - | - | 1 | - |
| macrolithic tools     | - | - | - | - | - | 3 |

### 3.2.4.2.4.2 Grinding stones

When this site was first investigated, the most noticeable feature was the large number of grinding stones lying on the surface of the shelter floor. Forty-five stones were counted, many of them with pestles resting on the grinding surface, while isolated pestles were also found. Four of the grinding stones had two smooth surfaces. Grinding stones and fragments of grinding stones were also found at lower levels in the excavation (plate 23). The most striking find was two grinding stones and a large, unworked granite slab, enclosing a concentration of richus seeds. The sizes of the grinding stones varied. Most of them were flat, with a thickness of 2–10 cm and length/breadth dimension of 15–20 cm. A small grinding stone made of sandstone (plate 23 a) must have been used for preparing small amounts of material.

The fragments of a smoking pipe carved out of soapstone, a well-shaped, oval, grooved stone of the same material, and a perforated stone pendant made of talcite mica schist have been described previously (Sandelskowsky 1974).

Red staining on the polished surface of four grinding stones, one of them found in the dark grey layer implies that they were used for grinding ochre. The remains of Inara and richus seeds near some of the grinding stones suggest other uses made of them. As was mentioned before (Sandelskowsky 1974), salt might have been another substance that was ground up, since this is a use made of grinding stones by the Topmar living along the Kuiseb today. Rounded quartz cobbles, with a diameter of 5–10 cm and with marks of battering or pecking, probably belong to this tool kit as well. With use these might have become smooth pestles.
3.2.4.3 Non-lithic artefacts

Non-lithic artefacts occurred in much smaller numbers than did the stone tools. All those found in the excavation were therefore recorded (table 6).

3.2.4.3.1 Pottery

Only seven undecorated body sherds were found inside the shelter. Six were found on or above the dung floor, while one small shard was beyond the edge of the dung floor and in the vegetation layer. Their paste was dark and fairly fine. Amongst the boulders outside the shelter, were one complete (plate 17) and one broken pot, whose paste was similar to that of the sherds found in the shelter. The broken pot had a well-defined, pointed base, whereas the other was not quite so pronounced, although it also had the thickening at the centre of the base which is characteristic of these pointed-based pots. Neither of them had lugs or decoration, nor did they have a well-defined neck or rim. The unbroken pot had small holes drilled into its wall near the opening, a feature often found on pots in the Namib. This probably served for the fastening of a handle made of leather or fibre.

Plate 17: Clay pot found among granite boulders close to Mirbib Hill Shelter

3.2.4.3.2 Metal

Two copper beads, nine fragments of copper and what looks like the blade of a pocket knife were found close to the surface (plate 18 d, 19 c). One of the copper beads is very well preserved and shows a seam on the side. Two scraps of iron are 2.5 mm in diameter.
3.2.4.35 Ostrich eggshell

The most common use of ostrich eggshell was for the making of beads. These were found in all layers and varied from fairly large, disc-shaped specimens to small, very well-rounded ones, no broader than the thickness of the shell (plate 21 d, 22 a). Many of the beads had been broken. Twelve pendants were represented by fragments only. Engraved decoration was conspicuously absent. A few fragments were coloured with ochre red.

3.2.4.36 Bone

Fourteen pieces of wood with signs of working were found in the layers above the dark grey layer. Notches had been cut into the side of a small spike or peg. Most of the fragments had shaped, pointed ends or had been perforated. Pieces of soft wood had also been coloured with red ochre (plate 18, 19 f, 20 d).

3.2.4.37 Twine

Fragments of cord, pieces of knotted grass and fibrous strands occurred in the layers above the dark grey one (plates 18 a, 19 d, 20 a). They may represent snare carried on, slings and perhaps simple baskets.

3.2.4.38 Pierced Nara seeds

Nara seeds with one or two holes drilled through them were found in the three central layers (plate 21 b). Some of these seeds had also been coloured with ochre (plate 19 b). Others had been coloured but not pierced.

---

**TABLE 6: Distribution of modified stones and non-lithic artefacts**

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Note 18: Artefacts found on the surface: a) twine, b) worked bone, c) worked wood, d) metal, e) stone pendant

Photo: G. Kornick

Note 19: Artefacts found in the dung (floor): a) 3 strands of human hair encrusted with ochre, b) ochred hair, c) copper bead, d) twine, e) worked bone, f) wooden bead, g, h) bone points.
3.2.4 Conclusion

The description and analysis of the microlithic assemblage was done to see whether the stone tools in the six layers of the Mirabib deposit differed from one another. The approach was adapted to that used by Wenk (1972). Although the results of a detailed analysis which he is undertaking are not yet published, personal consultation has led to the conclusion that the Later Stone Age collection from Mirabib (i.e. the top five layers) exhibits similar characteristics as material found along the western edge of the escarpment in the Namib. The similarity is illustrated by such diagnostic tools as the very small segment in clear quartz; the larger double crescent often made of jasper or agate; well worked bone, often shaped into tubular beads, ostrich egg-shell pendants and the abundance of grinding stones.

In the four central layers there is a remarkable uniformity of size, shape and attributes of secondary work among the microliths. Accordingly, there seems to have been little change in the requirements for workmanship of stone tools for approximately 7000 years. The oldest tools at Mirabib were found in sterile red dune sand underneath a layer dated to over 8000 B.P. These stone implements differ from the Later Stone Age assemblage in shape, size, raw material and frequency. Considering the lack of organic material in this part of the deposit suggested that the shelter was used infrequently briefly during that time period.

With the introduction of smaller tools in a rich variety of raw materials the shelter was also used more intensively. The contrast in the use between these two layers is so marked that it is probable that there was a considerable time between the two occupational horizons.

Although the floral and faunal evidence indicates monsoon conditions during the deposition of the grey layer, the frequency of stone tools is relatively low. Less intensive use of the shelter or a relatively low population density compared to that in the overlying layers are two possible explanations. But it is possible that more use was made of wood and bone as a raw material and that this has decayed together with the organic material.

The central sandy layer which may reflect a transition toward conditions drier than those of both underlying dark grey layer and the overlying vegetation layer, contains the greatest concentration of stone tools per volume of excavated deposit. The high concentration of stone seeds is an important feature of this layer. Together with this, the fabric found in the vegetation layer 40 stone seeds with either pierced, ochred or both, an indication of value of this plant. In the dung floor only three
these items were found and none in the surface layer. In 1974 Dentinger noticed a Topnaar woman wearing three hair plaitings around her neck as a cure against a chest cold (Dentinger 1977, 34).

Changes in the climate and consequently in the environment seem to distinguish the central sandy layer from the vegetation-rich layer since there is no obvious difference in the cultural material from the two layers. In contrast to this the difference between the vegetation-rich layer and the dung floor is justified by a most conspicuous cultural change. The dung floor with hair of sheep as well as five potsherds embedded in it signifies an important historical event in the Namib approximately 1500 years ago. Apparently these features were introduced rather suddenly since nothing, apart from a single potsherd, was found in the preceding layers indicating a gradual acquisition of either sheep or pottery. It is similarly surprising to find no sign of herding and only one potsherd in the layer on top of the dung floor. Nevertheless two complete pots were found very close to the shelter and these had, no doubt, been used by the last inhabitants of the shelter.

Who were these people?

The present day indigenous population consists of various genetic and linguistic elements. Most people living in the villages along the Kuiseb River consider themselves to be Topnaar Hottentots. But both their appearance and such family names as Herero, Fischer and Engelbrecht indicate the presence of other racial and ethnic elements. The name of one abandoned settlement on the bank of the Kuiseb River is Damaron //hawadi (the place where Damara children died). According to statements of Topnaar informants Damara people were living along the Kuiseb River when the Topnaar came to the area. This would agree with the suggestion made earlier on (see page 257) about Topnaar-Dama relationships. It would also fit with the results of the skeletal study done by de Villiers suggesting an association of physical characteristics of the Gorrob skeleton with the Dama.

The metal fragments found in the surface layer mark the most recent and the most far-reaching change ever to come about in the life of people inhabiting the Namib. This is the arrival of western civilization with all its consequences and by-products. The absence of sheep and the low incidence of pottery in the surface layer raises the question of how the last inhabitants of Mirabib related to the previous occupation, when the shelter had been used for stock. Was this the same cultural group?

The evidence presently available does not answer the question. But the relationship between hunters and herders, resident populations and immigrants, and more in particular the role of the Dama in the history of this country are themes which are currently being investigated by a number of people (Hoistze 1972, Wadley 1977, Wendt 1975). The results of all these studies should soon contribute to a coherent picture of our prehistory.

![Image: Artifacts found in the vegetation-rich layer; a) leather, b) pierced inaka, c) worked bone, d) ostrich egg-shell pendant, e) bone beads, f) grooved stone.](Photo: G. Komneck)
Plate 22: Artefacts from the central sandy layer and the dark grey layer; a) ostrich eggshell beads, b) bone point.

Photo: G. Kornicki

Plate 25: Grinding stones from a) dark grey layer, b) central sandy layer

Photo: G. Kornicki
3.2.5 *Archaeozoology*

All faunal remains found in the deposit were collected, mostly by hand from the sieve. There was a considerable amount of dung, generally in the form of turds. Samples were kept.

### 3.2.5.1 Bone of larger animals

Bones representing food remains at archaeological sites are usually very fragmentated and Mirabib was no exception to this rule. Apart from isolated tooth fragments of herbivores which occurred in all the layers, no significant identifications could be assigned to any of the fragments found. But the bone found in the dark grey layer differed from that in the other layers. The fragments were extremely brittle and could only be removed with great care and effort. Furthermore, they were larger and more numerous than the pieces of bone in the other layers. Most of these fragments were 5 cm or 6 cm long with a diameter of 2–3 cm, probably representing pieces of long bone.

### 3.2.5.2 Ostrich egg-shell fragments

Apart from eating ostrich eggs, just as other birds eggs would have provided readily available food, ostrich egg-shell was an important raw material. The shells are best known for their use as water containers and for the making of beads and ornaments. Considerable quantities of burnt egg-shell (fig. 13) suggest not only cooking of the eggs but also using the shell as a pot. Some fragments were covered with red ochre. One looked as though it had broken off the edge of a container because apart from red colour on the inside red paint had apparently spilled over the edge and had run down the outside of the shell as well. Specimens were found representing various stages in the making of beads: accumulations of angular fragments, angular fragments with complete and incomplete perforations and rounded discs without holes (plate 41).

### 3.2.5.3 Feathers and hair

In all layers very small, soft, green-yellow feathers were found. Probably they were parts of owl pellets. Larger feathers were a rare find. They looked as though they had been cut, perhaps to be inserted into the ends of arrows.

Hair which was firmly embedded in the dung floor and therefore in an unambiguously context was submitted to the Forensic Laboratory of the South African Police in Pretoria. Using the Hardy microtome cross sections were made and compared with those of identified material.

Dark hair with medulla was identified as hair of sheep (Krölling and Grau 1960).

### 3.2.5.4 Marine shell

Sixty-three fragments of marine shell and ten complete specimens of *Patella granularis* (identifications by Brian Kersley, S. Afr. Museum, Cape Town), were found in the excavation at Mirabib. The Patella shells were mixed with a concentration of richus seeds found in the vegetation-rich layer. The small but consistent occurrence of marine shell in all the layers except the dark grey and red sand layers at the base of the deposit indicates contact with the coast. Possibly people frequenting Mirabib moved to the coast as part of their migratory cycle. Alternately they may have met people who came from the coast.

All the identified species have been found along the coast of the central Namib implying similar coastal environments during the past 6000 years.

---

**Figure 13:** Distribution of ostrich egg-shell fragments.
TABLE 7: Distribution of marine shell

<table>
<thead>
<tr>
<th></th>
<th>Peronopera</th>
<th>Donax serrae</th>
<th>Patella sp.</th>
<th>Marginella sapiens</th>
<th>Arbogastia argus</th>
<th>Unidentifiable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>7</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dune floor</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vegetation</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Central sandy</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Dark grey</td>
<td>no marine shells found</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basal red sand</td>
<td>no significant amounts of organic material present</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.5.5 Microfauna

A study of the microfaunal remains (Brain and Brain 1977 Those shanks) contained in owl pellets provided crucially important evidence on environmental changes during the past 6000 years. Unfortunately the older layers contained only such poorly preserved organic remains that they could not be identified or the organic content was altogether negligible.

Apart from documenting climatic changes which are also indicated by other kinds of data from the Miralib deposit the analysis of the microfauna provided supportive information on the cyclicity of environmental changes suggested by Mörner (1973).

4 DISCUSSION

This report provides information on all the themes which the Namib palaeo-ecology project was to investigate i.e. the reconstruction of environmental conditions, the history of prehistoric populations in the Namib and man-environment relationships.

Most of the evidence came from an excavation in the Miralib Hill Shelter where the organic material was very well preserved. One kind of data was used for the reconstruction of the palaeo-environment, whereas other data provided information on the subsistence strategies of the shelter's inhabitants. The microfaunal remains were crucial in that they provided information on changes not governed by human preferences or choices.

4.1 Past environments

The distribution of the different kinds of sites located in the Namib indicates changes in environmental conditions. Middle and Early Stone Age sites which are today situated in the utterly inhospitable dunefield of the central Namib to the exclusion of Later Stone Age sites imply that conditions were less severe here when Middle and Early Stone Age populations inhabited the area. The stone tools found at these sites cannot be dated absolutely but on the basis of comparison with similar tools from dated sites elsewhere (Clark 1970, 79) it is inferred that they date back to Pleistocene times.

In contrast to the finds of early tools in the dunes, the sites along the coast belong almost exclusively to the Later Stone Age. Middle Stone Age tools were found only at Conception Bay, some distance from the shore and on rock outcrops at Noordhoek, several metres above sea level. The dearth of older tools along the coast may be due to the weathering processes on a desert coast or to marine transgressions (Carrington and Kenley 1969).

The distribution of prehistoric settlements along the rivers relates to changes in the natural surroundings as well as to socio-economic factors. Further documentation of these settlements on the basis of archaeological and ethnological records promises additional information on the history of the riverine environment and its inhabitants.

The Miralib site provided evidence of the Holocene environment with radiometric dates covering the last 8400 years. The oldest tools in the shelter which are not associated with datable material differ distinctly from those found in the overlying layers, thereby extending our view beyond the 8400 years. These earliest stone tools in the Miralib deposit are found in pockets of fine red sand filling hollows in the bed-rock. Containing the largest quantity of fine sand and the lowest quantities of clays and organic material, this deposit reflects conditions which have not been experienced since. The contrast between the initial deposit in the shelter and the subsequent dark grey layer suggests that the shelter was not used for some time between the deposits of these two layers.

The dark grey layer, which rests on bed-rock or on the pockets of the basal red sand contains organic carbon, charcoal, ash and fossilized plant and animal material. Together with the artefactual assemblage this provides an occupation of the shelter. The ratio of organic to mineralogic components is in comparison with that of the underlying as well as the overlying layers shows less aeolian material. This could imply denser vegetation and higher rainfall. Age and the influence of fire heat probably account for the brittleness of the organic material found in this layer.

During the next 2100 years there seems to have been a trend toward drier conditions at Miralib. This is documented in the central sandy layer by the high content of aeolian sand and the low frequency of plant matter. Cycles of drier and moister conditions seem to have been superimposed on this general trend. They are indicated by phases of more and less intensive habitation evident in concentrations of high organic content, bands and lenses of ash and charcoal within the central sandy layer. Similarly an oscillation of moist and dry
conditions is reflected in the analysis of owl pellet remains (Brain and Brain 1977). The relationship of geckos and geckos in the owl pellets is a reciprocal one with geckos relating to more humidity and geckos to greater aridity. This evidence agrees with a model for world-wide climatic cyclicism suggested by Mörner on the basis of land, sea and air data (Mörner 1973). Though dryer than during the preceding phase accompanying the deposition of the dark grey layer the conditions during the time of the central sandy layer on the average were more favourable than at present.

Another shift back to moister conditions is signified in the next layer by large quantities of vegetation remains and a decrease in aeolian material. According to Mörner's hypothesis this period falls approximately midway between two peaks of deterioration (ibid. 112). With the central sandy layer representing one of these peaks the other was represented by the dry phase within the last 900 years marked by the high frequencies of gecko bones in the owl pellet remains. Presumably such moister conditions would have meant weaker wet seasons than not wet enough to seriously affect the conditions of preservation in the shelter. Although concentrations in inara and ricinus seeds are a special feature in this layer, the former do not occur as exclusively as they did in the central sandy layer. The ricinus seeds could imply more water in the drainage which under modern conditions carry surface water for only a few hours during the rainy season.

The dung floor is a striking component in the Mirabib stratigraphy. In spite of an apparent age gap separating it from the previous layer there is no matching sedimentological feature nor an obvious break in the artefactual tradition. In the owl pellet remains the Endromidinae still occur though in much smaller numbers. The remarkable economic innovation of sheep herding probably took place towards the end of the moister phase in which the vegetation-rich layer relates.

The dung floor is covered by a clearly distinguishable layer of loose, sandy material in which no signs of sheep herding are evident. Stone implements were still in use though in much smaller numbers, possibly on account of metal having become available. The owl pellet remains indicate two periods of extremely dry conditions within the most recent depositional phase probably covering the last 500 years.

At its deepest point the Mirabib deposit is less than a metre thick and yet it covers a time period of well over 8000 years. The rate of surface deposition observed over a four year period was slow and progressive in this extremely well protected shelter. These facts and the relatively large area over which the excavation extended, have led to the conclusion that the different layers reflect average climatic conditions. It is unlikely that a phenomenon such as an isolated good rainy season would show up evenly in the form of a vegetation-rich layer or in large concentrations of owl pellet remains over a surface as large as the one that was excavated.

In the following diagram (table 8) the palaeo-ecological data from Mirabib is placed into a general scheme for worldwide climatic change postulated by Mörner (1973).

4.2 The history of people living in the Namib

The range of stone tools and archaeological features in the Namib gives a long account of human settlement and behaviour. The deposits at Mirabib cover only a short part of this story.

The bulk of the stone tools recovered from the excavation at this site are typical of the Later Stone Age. But there are two obvious changes, one occurring near the base of the deposit and the other near the surface. Makers of the stone artifacts found in the basal red sand chose other raw materials, sizes and shapes than were selected in subsequent times. Other requirements and conditions probably dictated using the shelter differently than was done later.

A long time may have passed before people under changed environmental conditions began living in the shelter for longer periods of time. How long these periods were and when they occurred probably depended on rainfall. The finds of inara seeds and the observations of how this food plant is used today suggest that those months when the inara was ripe were spent at or near the inara fields. The height of the inara season also seems to relate to rainfall affects indirectly by underground water becoming available. Although the seasonality of the inara is not well known it is apparent that the period when there is inara available is relatively short, perhaps two to three months.

The finds of marine shells and ethnographic accounts (Sydow 1973) indicate that the coast presented another station in the seasonal cycle. Since the marine food supply is a fairly stable one it is probable that it was used when other areas offered less. The rainy season probably offered most at Mirabib. Since it is also the only time when water would be readily available it is suggested that that would be the time spent there.

The bulk of stone tools found at Mirabib are microththalic and of remarkable uniformity in size, shape and raw material. Together with other cultural items such as ostrich egg-shell ornaments, ochre and artifacts made of bone and shell materials a conservative, well-adapted tradition of hunting and gathering is documented for most of the time that the Mirabib Shelter was occupied.

The 15th century skeleton, found beneath a stone cairn resembling numerous structures of that kind in the area, implies that a population with distinctive burial practices frequented the Kuiseb River region. A similar date for a clay pot from Constitution Bay (Vogel pers. comm.) indicates that the coast was also exploited at that time. The skeletal characteristics of the Gorob grave skeleton do not resemble those of bones previously associated with
TABLE 8: Data from Mirabbib compared to model constructed by Mörner (1973)

<table>
<thead>
<tr>
<th>Mörner</th>
<th>Yrs B.P.</th>
<th>Mirabbib</th>
</tr>
</thead>
<tbody>
<tr>
<td>high frequency cycles (230 - 400 yrs)</td>
<td>1700</td>
<td>500 dry</td>
</tr>
<tr>
<td>deterioration</td>
<td>2000</td>
<td>1900 dung floor</td>
</tr>
<tr>
<td>deterioration</td>
<td>2750</td>
<td></td>
</tr>
<tr>
<td>low frequency cycle (650 - 850 yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5000</td>
<td>5180 vegetation-rich layer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5570 central sandy layer</td>
</tr>
<tr>
<td></td>
<td>6000</td>
<td>6470</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6560</td>
</tr>
<tr>
<td>high frequency cycle (230 - 400 yrs)</td>
<td>7000</td>
<td></td>
</tr>
<tr>
<td>deterioration</td>
<td>8000</td>
<td>8200 dark grey layer</td>
</tr>
<tr>
<td>amelioration</td>
<td>9000</td>
<td>8400</td>
</tr>
<tr>
<td>amelioration</td>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>high frequency cycles (230 - 400 yrs)</td>
<td>11200</td>
<td>basal red sand?</td>
</tr>
<tr>
<td></td>
<td>13000</td>
<td></td>
</tr>
</tbody>
</table>

Coastal sites (Sandelowsky and Pendleton 1970, 53). This inland one is more robust and has provisionally been assigned to the Dama (Appendix III). Historically these people, who present puzzles in the ethnography (Kruusman 1969, Wedley 1977), have been well documented in this area (Kochler 1969).

According to the age of the skeleton their history here might go back seven to eight centuries. In this case it is not unlikely that they were also contacted with the fifth century phenomenon of sheep herding. Apparently this was introduced rather suddenly into an area where a hunting and gathering way of life had been practiced for some 7000 years. Remains of sheep have also been found at the Big Elephant Shelter in the Ergo Mountains (Wedley 1977) implying a similar situation as at Mirabbib: hunter-gatherers coming into contact with...
herding. The nature of this relationship will have to be investigated in the course of future archaeological and anthropological work.

The ultimate change in the way of life of the people using the Mirabib Hill Shelter came about with the arrival of western civilization. A few fragments of metal and glass replacing many stone tools were the first signs of this far reaching event. The shelter has been abandoned for some time, certainly since the area was declared a game park. Beer cans, plastic bags and other plastic residue represent the modern epoch at Mirabib.

4.3 Man-environment relationships

The evidence at Mirabib shows that prehistoric man survived environmental changes ranging from conditions more arid than today to more humid ones. Rock paintings and various items of material culture indicate not merely survival but a well developed cultural tradition providing for artistic expression and social custom.

The most successful subsistence strategy seems to have been one in which three or four different areas were systematically exploited. The coast, the river banks (with Nara fields) and the inland rainfall areas would have represented the different ecological niches. Mirabib is situated on the edge of the inland rainfall area and as such would have been a suitable location from which the riverine and coastal areas as well as the interior could be exploited.

The Nara plant is the best documented staple used for most of the time that Mirabib was inhabited. As such this area fits into a geographical model of sub-Saharan Africa constructed by Deacon (map 2). It suggests that Holocene hunter-gatherer communities exploited one specific plant food adaptively and systematically. They were not, as had previously been suggested, wholly opportunistic.

Considering that the Nama is a desert the question arises why people would live in such a marginal area. Population pressure might be invoked as a reason but it is unlikely that this part of the continent was ever that densely populated (Clark 1979, 154). Historic records documenting the Tsiman people where they are living today date from a time when the interior was hardly inhabited (Palgrave 1977). It would therefore seem that people lived here by choice because this area offered more favourable conditions than other areas.

Apart from air, the body’s most immediate need is for water, a rare commodity in the desert. But with an intimate knowledge of the surroundings the problem of water can be solved, if the requirements can be assessed accurately and if the water sources are known. Often requirement is dictated more by cultural expectation than by biological need. The water necessary for drinking is a fraction of that needed for washing clothes and body. Although the river courses in the

Map 2: Areas where specific plants were predominant in their significance to man during the Holocene (after Deacon)
Namib are dry on the surface for most of the year, there is an abundant store of subterranean water which can be reached by digging one or two metres into the ground. For hunting the absence of water is an advantage because the game will congregate at the isolated water-holes in larger numbers. Animals dangerous to life and health such as infection causing bacteria, disease carrying insects, large snakes and aggressive mammal are rare or absent in the desert. Where the number of plant species in the desert is small it is easier to acquire a detailed knowledge of every plant than to do the same with a complex flora. It is suggested that a simple system can be handled more efficiently than a complex one.

The edge of the Namib Desert is seen as a fairly ideal living situation and it is suggested that the crucial factor for groups inhabiting this area was a control over population density. In other words, time and space permitting, withdrawal into one or other of the zones in use, this habitat can and has been successfully exploited over thousands of years without having been destroyed for future use. Changes in the economy such as the introduction of sheep must have had an effect on the environment but even that event was negligible compared to what is happening now. Recent developments are fences, gods, water pipelines, canals, tourist camps, and subsequent dumping of rubbish. The store of underground water is tapped in vast quantities for the first time. Mining activities involving drilling, air prospecting, telephone structures, trenches scarring the surface as well as the concomitant increase in human activity must be having an unprecedented effect on all the populations and will shortly be altering the total Namib environment.

A model designed by Horace Quick, a geographer from the University of Colorado, U.S.A., is presented here to illustrate possible developments in the Namib. The model has been simplified. It is based on the assumption that an environment (E) can exist without a population (P). But any organic population requires an environment and the two factors will affect each other. Once there is a human population there will be culture (C) representing a third factor which could form an equilibrium with the other two. Such a balance has been maintained at Mirabib for over 8000 years.

Technology (T) which covers industrialisation, has such effects as pollution and over-exploitation of natural resources which are threatening the area surrounding in many parts of the world and may reduce environments to a state unfit for human population.

The reason for presenting this model is to raise the question of whether the novel utilization of the Namib Desert Park is to the best interest of everyone concerned. A panel of experts from all fields should investigate this question with the aim of regarding if not preventing the process by which this area is being turned from an inhabitable area into an uninhabitable one.

5 ACKNOWLEDGEMENTS

The work which has been reported on was supported by an ad hoc grant from the Council of Scientific and Industrial Research. For most of the time between 1975 and 1976 I was resident at the Namib Desert Research Institute where I could make full use of the excellent housing and laboratory facilities provided by the South West African Nature Conservation and Tourism Division. Field work and analysis of the data was only possible with the assistance of the Namib Desert Research Institute in Windhoek and the South African Institute of Medical Research in Pretoria. The South African Institute of Medical Research in Pretoria, the United States Geological Survey, the University of Cape Town, and the University of Stellenbosch provided invaluable help.

To my supervisor and co-worker in this project, Dr. C. K. Brain, I would like to document my appreciation of the fact that he suggested this work and was instrumental in enabling me to do it. Since the radio-carbon dates provide the chronological basis for the historical and environmental evidence presented here I wish to express my sincere thanks to Dr. John Vogel for processing the samples, for his cooperation and active interest shown in this work. To my co-workers, Dr. H. Scholz, U. Beattinger, R. Ellis, E. Robinson, Prof. C. Bornman, H. zur Strauss, J. Dixon and C. Stuart, may I say that this project consists of their contributions. Discussions with my colleagues in South West Africa, in particular with Dr. E. Wendt and Mr. A. Vierock were essential for seeing Mirabib in perspective with other sites in this country. I am particularly indebted to Janette Desecon of the University of Stellenbosch who read the manuscript and gave valuable advice and to Burg Flemming of the Dept. Marine Geology, University of Cape Town, for bringing the work of Nils-Axel Mörner to my attention.

Fig. 14: Model adapted from Quick (pers. comm.)
I would like to thank the Nature Conservation and Tourism Division in South West Africa, in particular Mr. B. J. G. de la Bat, Dr. E. Joubert, Mr. P. S. Swart and Amy Casburn, not only for their consistent interest and support in this work, but also for publishing the results in this form. Mr. P. Mostert, Nature Conservator of Gobabis, supervised the filling in of the excavation.

My friend, Pauline Macé, is once again responsible for expressing me in proper English and for seeing to it that Carolyn Leibrandt present the work in type and order.

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APPENDIX I: Temperatures and precipitation.
I thank Mr. and Mrs. Name of the Weather Bureau in Windhoek for these data.

TABLE 1: Annual averages for the ten years 1965-1975

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Pelican Point</td>
<td>14°28'2''E</td>
<td>22°55'S</td>
<td>9.9mm</td>
<td>147 days</td>
<td>18.4°C</td>
<td>12.5°C</td>
</tr>
<tr>
<td>Omaheke</td>
<td>15°33'2''E</td>
<td>22°53'S</td>
<td>12.7mm</td>
<td>95 days</td>
<td>30.0°C</td>
<td>12.8°C</td>
</tr>
<tr>
<td>Klein Ausb</td>
<td>26°40'0''E</td>
<td>21°40'S</td>
<td>228mm</td>
<td>7 days</td>
<td>97.1°C</td>
<td>10.4°C</td>
</tr>
</tbody>
</table>

APPENDIX II: Soil profiles
by H. Scholz, P.B. 13154, Windhoek.

Soil profile A (table 1)

Locality: 2.5 km west of Mirabib Hill Shelter.
Height above sea level: 550 m.
Average rainfall p.a.: below 50 mm.
Average annual temperature: unknown.
Flora: Stipagrostis ciliata: at the time 15-20 cm high; 50% coverage.
Substrate: calcareous calcrite, aeolian sand, granite.
Depth: shallow.
Topography: Peneplain with shallow gradient dissected by a few erosion gullies.
General description: calcareous soil of the desert.

Soil profile B (table 1)

Locality: 1.5 km north of the Mirabib Hill Shelter.
Height above sea level: 550 m.
Average rainfall p.a.: below 50 mm.
Average annual temperature: unknown.
Flora: Pentalidium satosum community.
Substrate: colluvium of weathered granite rubble and aeolian sand.
Depth: shallow to medium; occasionally deep.
Topography: Peneplain dissected by valleys and erosion gullies.
General description:
In the vicinity of Mirabib the most typical valley system of this area is found between the Inselberg Mirabib and Mirabib Hill. It is an erosion gully no more than 50 cm deep and between 50 and 100 m wide, filled with loose, locally weathered material. Resembling other water deposits, the sediments of these valleys are heterogeneous. In some places large stones have accumulated; in others there are more, fine-grained deposits.
Since this is a relatively young system, no obvious formation of calcrite has taken place along the banks. This is characteristic of other drainages in this area. Not only has lateral sorting taken place in these valley sediments, but a horizontal sorting of the material is even more noticeable. However, a soil formation in the pedological sense could not yet take place because the material is too young.
1) 0—7 cm: gritty sand with single grain structure and a few stones; very poorly weathered; occasionally calcareous; few roots.

2) 7—17 cm: stony grit; single grain structure; few roots. The grit consists mainly of quartz, feldspar, mica and granitic rubble which has not yet disintegrated into individual minerals.

3) 17—22 cm: fine sand with single grain structure and a high content of biotite. This sand probably represents alluvial material in a secondary deposit. In comparison to the underlying material this layer appears to have more roots, although these are represented mostly by fine root hairs.

4) 22—50 cm: essentially similar to horizon 2 but with more roots; approximately as in horizon 3;

5) 50 cm: poorly weathered granite rock.

A loose layer of grit, consisting mostly of quartz and feldspar, covers the surface of the soil profile B. The entire section of this profile is free of calcite. This indicates a young soil where little chemical weathering has taken place. This is therefore, essentially an accumulation of physically-weathered rubble. Nevertheless, considering local conditions, this provides a favourable location for plant growth in the area.

**Soil profile C (table 1)**

<table>
<thead>
<tr>
<th>Soil profile C (table 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Località: 2.0 km north of Meraž.</td>
</tr>
<tr>
<td>Height above sea level: 550 m.</td>
</tr>
<tr>
<td>Average rainfall p.a.: below 50 mm.</td>
</tr>
<tr>
<td>Average annual temperature: unknown.</td>
</tr>
<tr>
<td>Flora: <em>Stipagrostis ciliata</em></td>
</tr>
<tr>
<td>Substrate: calcareous and decomposed granite.</td>
</tr>
<tr>
<td>Depth: shallow.</td>
</tr>
<tr>
<td>Topography: Pediplain dissected by drainages.</td>
</tr>
<tr>
<td>General description: This is an example of an older soil on the pediplain.</td>
</tr>
</tbody>
</table>

1) 0—12 cm: Light to ochre-brown; calcareous, stony, gritty, sand; poorly coherent structure with silty, vesicular layer on the surface; a fairly dense cover of grit and stones as well as some plant remains; local concentrations of roots.

2) 12—20 cm: as above, but more stony with depth; merging with weathered granitic rock.

Approximately 10 m from where soil profile C is situated, there is a shallow syrosem of the pediplain, accounted for by the surface structure. Whereas profile C has a higher elevation, the site of the syrosem is a gully-like depression. Here the water collects and runs off, thereby preventing soil formation as it could take place at the site of profile C.

### Table 1: Analysis of soil samples

<table>
<thead>
<tr>
<th>Sample</th>
<th><strong>A/1</strong></th>
<th><strong>A/2</strong></th>
<th><strong>B/1</strong></th>
<th><strong>B/2</strong></th>
<th><strong>B/3</strong></th>
<th><strong>C/1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth in cm</td>
<td>0—3</td>
<td>5—12</td>
<td>6—7</td>
<td>7—17</td>
<td>17—22</td>
<td>6—12</td>
</tr>
<tr>
<td>Particle size distribution (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine sand (0.02—0.2mm)</td>
<td>77</td>
<td>77</td>
<td>77</td>
<td>77</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>Coarse sand (2.0—0.5mm)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Medium sand (0.5—0.2mm)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
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<tr>
<td>Fine sand (0.2—0.02mm)</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
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<tr>
<td>Silt (0.02—0.002mm)</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Clay (&lt;0.002mm)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Net extractable cations (me/100g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Na</td>
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<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
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<tr>
<td>K</td>
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<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Ca</td>
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<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
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<tr>
<td>Mg</td>
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<td>6.75</td>
<td>6.75</td>
<td>6.75</td>
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<tr>
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<td>4.40</td>
<td>4.40</td>
<td>4.40</td>
<td>4.40</td>
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<tr>
<td>CEC</td>
<td>5.55</td>
<td>5.55</td>
<td>5.55</td>
<td>5.55</td>
<td>5.55</td>
<td>5.55</td>
</tr>
<tr>
<td>S. value/100g sand</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>CEC clay</td>
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<td>56.00</td>
<td>56.00</td>
<td>56.00</td>
<td>56.00</td>
<td>56.00</td>
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<tr>
<td>PH</td>
<td>7.9</td>
<td>7.9</td>
<td>7.9</td>
<td>7.9</td>
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<tr>
<td>% Co2O</td>
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<td>4.10</td>
<td>4.10</td>
<td>4.10</td>
<td>4.10</td>
<td>4.10</td>
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<tr>
<td>% CaO</td>
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<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
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<td>0.01</td>
</tr>
<tr>
<td>% Na2O</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>
APPENDIX III: Report on human skeletal remains from a grave (Goreb) in the Central Namib Desert by H. de Villiers, Department of General Anatomy, University of the Witwatersrand, Johannesburg.

The human remains comprise:

Cranium: although fractured, crushed and distorted is virtually complete.

Mandible: is complete but for the left coronoid process, the antero-superior border of the right coronoid process and the lateral border of the left condyle.

Teeth: Maxillary: the medial incisor and canine teeth are missing, although from the sockets there is evidence that the canine and right medial incisor were present at the time of death. The loss of the left medial incisor appears to have occurred sometime ante mortem as indicated by resorption of the socket. Mandibular: all mandibular teeth are present.

All teeth, except the third molars, show wear with dentine exposure.

Post cranial: 25 vertebrae and fragments thereof, including six cervical vertebrae and fragments of the sacrum. Fragments of the scapulae and innominate bones. The first left rib and rib fragments. Left ulna. Left femur and head greater trochanter of right. Right and left tibia. Right fibula and shaft of left. Left ischium, navicular and cuneiform bones.

Two metatarsal bones.

The remains are those of a fully adult individual, probably in the third decade. Owing to the fragmentary nature of the pelvic bones, it is not possible to assess the sex of the individual with any degree of accuracy. However, the rather robust cranial vault bones, mandible and post cranial bones suggest that these remains are those of a male rather than those of a female.

The estimated maximum living stature of the individual based on Trotter and Gleser's (1958) regression formula for American Negro males is 169.23 cm. However, as Trotter and Gleser point out it is possible that different equations may be needed even for the same racial group in successive generations.

The cranial vault has been crushed in the right frontal region and the individual vault bones have been distorted — in particular the frontal, right parietal and occipital bones. The sagittal suture has been obliterated, it would appear prematurely. The orbital and nasal regions have also been fractured and distorted. Owing to the crushing and distortion no reliable measurements of the cranial dimensions could be made. The cranial vault appears to have been ovoid in shape, short, of moderate breadth and height. The temporal squamae appear to have been moderately expanded, the parietal suture rising above the level of pterion. The occipital curve appears not to have been pronounced. The right mastoid process is undamaged and is of medium size (31.2 mm). The posterior root of the zygoma and the supramastoid crest show a moderate degree of development. The tympanic plate of the temporal bone is moderately thickened. The maxillary sinuses are large and expanded laterally; the hard palate is deep (estimated palatal depth 16 mm); and sloping anteriorly the dental arcade is horseshoe shaped. The subnasal portion of the maxilla is deep and apparently prognathous. The mandible is wide in relation to its length (Table 1).

TABLE 1: Mandibular measurements (in mm)

<table>
<thead>
<tr>
<th>Character</th>
<th>Goreb grave</th>
<th>S.A. Negro male mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>cyl</td>
<td>21.0</td>
<td>19.9</td>
</tr>
<tr>
<td>pl</td>
<td>35.0</td>
<td>57.6</td>
</tr>
<tr>
<td>rb</td>
<td>36.4</td>
<td>53.2</td>
</tr>
<tr>
<td>mna</td>
<td>51.5</td>
<td>39.0</td>
</tr>
<tr>
<td>cli</td>
<td>81.0</td>
<td>80.9</td>
</tr>
<tr>
<td>mth</td>
<td>30.0</td>
<td>26.5</td>
</tr>
<tr>
<td>hu</td>
<td>42.1</td>
<td>34.0</td>
</tr>
<tr>
<td>go</td>
<td>92.7</td>
<td>91.5</td>
</tr>
<tr>
<td>zz</td>
<td>41.8</td>
<td>46.0</td>
</tr>
<tr>
<td>ml</td>
<td>111.0</td>
<td>107.5</td>
</tr>
<tr>
<td>Ramal index</td>
<td>58.1</td>
<td>61.4</td>
</tr>
<tr>
<td>Ml</td>
<td>138.0</td>
<td>128.6</td>
</tr>
</tbody>
</table>

The corpus mandibulare is high (mth 31.5 mm and hu 42.1 mm); the lateral surface upper antero-posteriorly and is marked by a single posterio-superiorly directed mental foramen which lies below the apex of the second premolar nearer the lower margin of the corpus than the upper. The ramus is relatively broad (ramal index 66.1 %). The chin region is prominent, the mental protuberance is well developed, the resultant chin shape is projecting. There are two superior genial tubercles and a single median inferior tubercle. A mylohyoid bridge has converted the mylohyoid groove into a canal. The dental arcade is divergent U-shaped and the angles of the mandible are exverted.

The features of the cranium and mandible described are essentially Negroid in character. The individual represented by these remains may have been a member of a Bergdama population.

The cranium and mandible, as far as could be ascertained exhibit none of the morphological and metrical features generally associated with Khoesan skulls. On the other hand, the range of variation shown by Khoesan skulls is not well known.

REFERENCE

1958 TROTTER, M. and GLESER, G. C.