On the age of the artefact-bearing sediments in the valley north of Kerbehuk, Sperrgebiet, Namibia

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Abstract: Understanding the geomorphological history of the Sperrgebiet is important for the mining industry because the diamond-bearing ore is of alluvial affinities. The timing of geological and geomorphological events in the Sperrgebiet has been largely based on palaeontological evidence, supported by a few radio-isotopic age determinations made on volcanic rocks but recently, archaeological evidence has been discovered that led to modifications of some of the previously proposed stratigraphic schemes. We here report an occurrence of artefact-bearing deposits partly infilling a broad valley 8 km north of Kerbehuk, which provides evidence concerning late stages of landscape development in the region.

Key Words: Archaeology, chronology, sedimentation, Holocene, Spergebiet

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Introduction

Because of the presence of alluvial diamonds in the Sperrgebiet there has been a longstanding interest in its geomorphological evolution (Kaiser, 1926; Pickford, 2016a, 2016b; Corbett, 1919; Dauteuil *et al*. 2018; Picart *et al*. 2020). Understanding the geological processes that have operated in the region has motivated many researchers to delve into its geomorphological history at various scales from regional to local. The realisation that the distribution of diamonds was not random, but was the result of the interplay of many factors (erosion, transport, deposition, bedform characters, biological and climatic conditions among others) motivated many of these enquiries.

Concepts of the sequence and timing of geomorphological events in the Sperrgebiet have varied over the past century, usually when new evidence was found that refined previous notions of the timing of such events.

We here report on a series of well-stratified sandy deposits intercalated with thin layers of calc-crust in the floor of the broad valley 8 km north of Kerbehuk, which contain abundant evidence of artefacts and fauna indicating occupation of the area by humans during the recent past (Fig. 1).

During the 2016 survey, lack of time prevented an in-depth study of the deposits using archaeological excavation, but ostrich eggshells and shells of the marine gastropod (*Patella*) and those of oysters were observed in the thin calcareous crusts. The aim of this report is not only to put on record the discovery of a potentially important archaeological site, but also to throw light on the timing of some of the more recent geological events in the region.

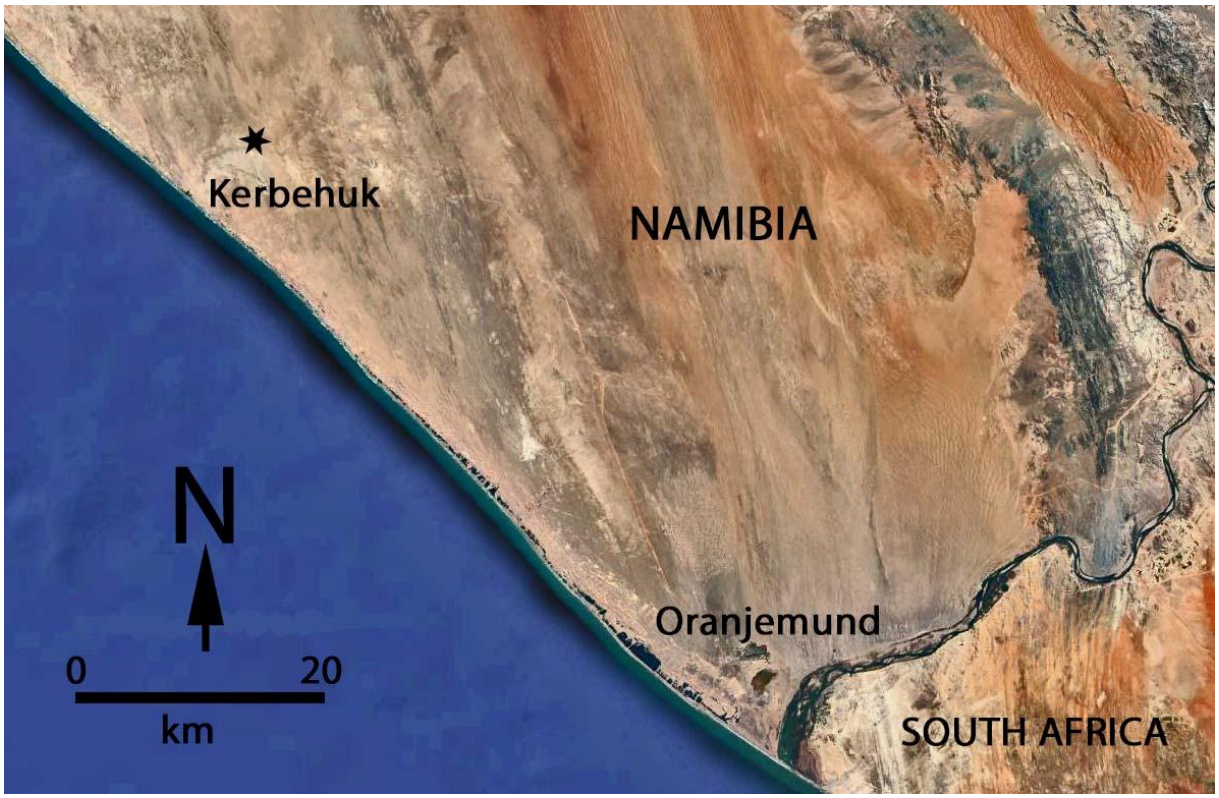

Figure 1. Location of Kerbehuk in the southern Sperrgebiet, Namibia. The star shows the location of the archaeological site (Image modified from Google Earth).

Stratigraphy and Site Formation

The stratigraphic succession in the immediate surroundings of the Kerbehuk archaeological site is provided in Table 1. The succession is dominated by erosional unconformities of long duration.

The valley in which the Holocene sand accumulated, was eroded after deposition of the Kerbehuk conglomerate, probably during the Oligocene low sea-stand, and is thus probably the same age as the valleys in the Northern Sperrgebiet which are infilled with early Miocene sediments (Elisabethfeld, Grillental, Fiskus, Langental). Small exposure in the floor of the Kerbehuk valley comprise conglomerate, of which some appear to have been ferruginised. Elsewhere in the Sperrgebiet, ferruginisation occurred during the late Oligocene and early Miocene (Pickford, 2016b), and it is inferred that the ferruginisation near Kerbehuk was part of the same event.

The Holocene strata owe their origin to the presence of water seepages in the valley which dampened sand particles being blown by the wind, upon which the particles settled due to surface tension effects, while some particles were trapped in vegetation growing around the seepages. Repeated many times, this process resulted in vertical accretion of fine sand layers. Most of the time, flow from the seepages was too weak to remove the sand particles so they accumulated on and around the seepages to produce low angle mounds with gently concave upper surfaces. During periods of lesser flow, calc-crusts formed by evaporation of mineral salts dissolved in the water (mainly calcium carbonate, but also gypsum).

At the archaeological site there are three such low-angle stratified mounds, which have had their peripheries eroded by the frequent boisterous winds that typify the coastal strip of the Sperrgebiet. The presence of these sediment mounds with gently concave upper surfaces attests to greater rates of seepage in the past than occurs at the present day in which seepage is sporadic and often absent.

Table 1. Summary stratigraphic succession in the vicinity of the Kerbehuk Archaeological Site.

Stratigraphic unit	**Age**
Loose sand	Modern
Fine sands intercalated with thin layers of calc-crust	Late Holocene
Namib Calc-crust	Mio-Pliocene
Ferruginisation of Kerbehuk conglomerate	Oligo-Miocene
Erosion of valley north of Kerbehuk	Oligocene
Kerbehuk conglomerate	Eocene
Basement complex	Proterozoic

Geomorphology

The broad East-West valley north of Kerbehuk is flanked on its south side by low cliffs of ferruginised conglomerate infilling the proto-Kerbehuk palaeo-valley which is incised into Basement Complex rocks of Proterozoic age (Fig. 2). The conglomerates infill an ancient fluvial valley, probably eroded during the Eocene. During the Oligocene low sea-stand, the drainage that formerly fed the proto-Kerbehuk river, shifted its course northwards where the less resistant rocks of the basement complex crop out, eroding a new valley during the early Oligocene. This valley contains small quantities of conglomerate; probably of Oligo-Miocene age, some of which may have been ferruginised, but overall the valley is free of sediments other than recent and mobile sands.

It is in this valley that the artefact-bearing stratified sands and calc-crusts accumulated during the Holocene (Fig. 3-5).

Figure 2. Southern flank of the present-day valley 8 km north of Kerbehuk. The bedded deposits overlying Basement Complex rocks are infilling the Eocene proto-Kerbehuk drainage and were pervasively ferruginised during the Oligo-Miocene. As a result of differential erosion, the Kerbehuk drainage system shifted northwards during the Oligocene low sea-stand, its axis now lying ca 1 km north of where it was located during the Eocene (right in image).

Archaeology

Kerbehuk

A potentially important archaeological site occurs northeast of Kerbehuk at 28°10'39.0"S: 16°01'28.6"E: 74 masl, 7 km from the nearest seashore (Figs 1-4). The deposits comprise three low mounds with a thickness of 5 metres of fine sand lying in the floor of the valley, subdivided into five or more beds by thin calcareous crusts. The basal beds contain abundant ostrich eggshell fragments, some of which have been burnt. There are also burnt tortoise bones and shells of *Patella* and *Ostrea* associated with stone tools, pottery and grindstones.

Figure 3. Two of the mounds with gently concave upper surfaces, comprise stratified deposits partly infilling the broad valley 8 km north of Kerbehuk. The area is an important archaeological site with concentrations (circles) of ostrich eggshell fragments (many of which have been burnt), tortoise bones, *Patella* and Oyster shells, as well as stone flakes, grindstones and pottery (scale : 500 m) (Vertical image modified from Google Earth).

Figure 4. Calc-crust terraces and intercalated sands in the valley 8 km north of Kerbehuk (1-3 : three of the terraces of which there are at least five).

Figure 5. One of the calc-crusts forming a terrace-like feature in floor of the valley 8 km north of Kerbehuk, Sperrgebiet, Namibia.

Figure 6. Archaeological materials associated with the stratified valley infilling north of Kerbehuk. A) large grindstone (or grinding slab) and a possible tethering stone or stone for anchoring huts near the low bush, B) various stone tools and fist sized stones associated with a layer of calc-crust, C) decorated potsherds, D) ostrich eggshell fragments, some of which have been burnt, E) *Patella* shell (centre) and ostrich eggshell fragments (top right) lying on calc-crust, F) ostrich eggshell fragments in deflated context.

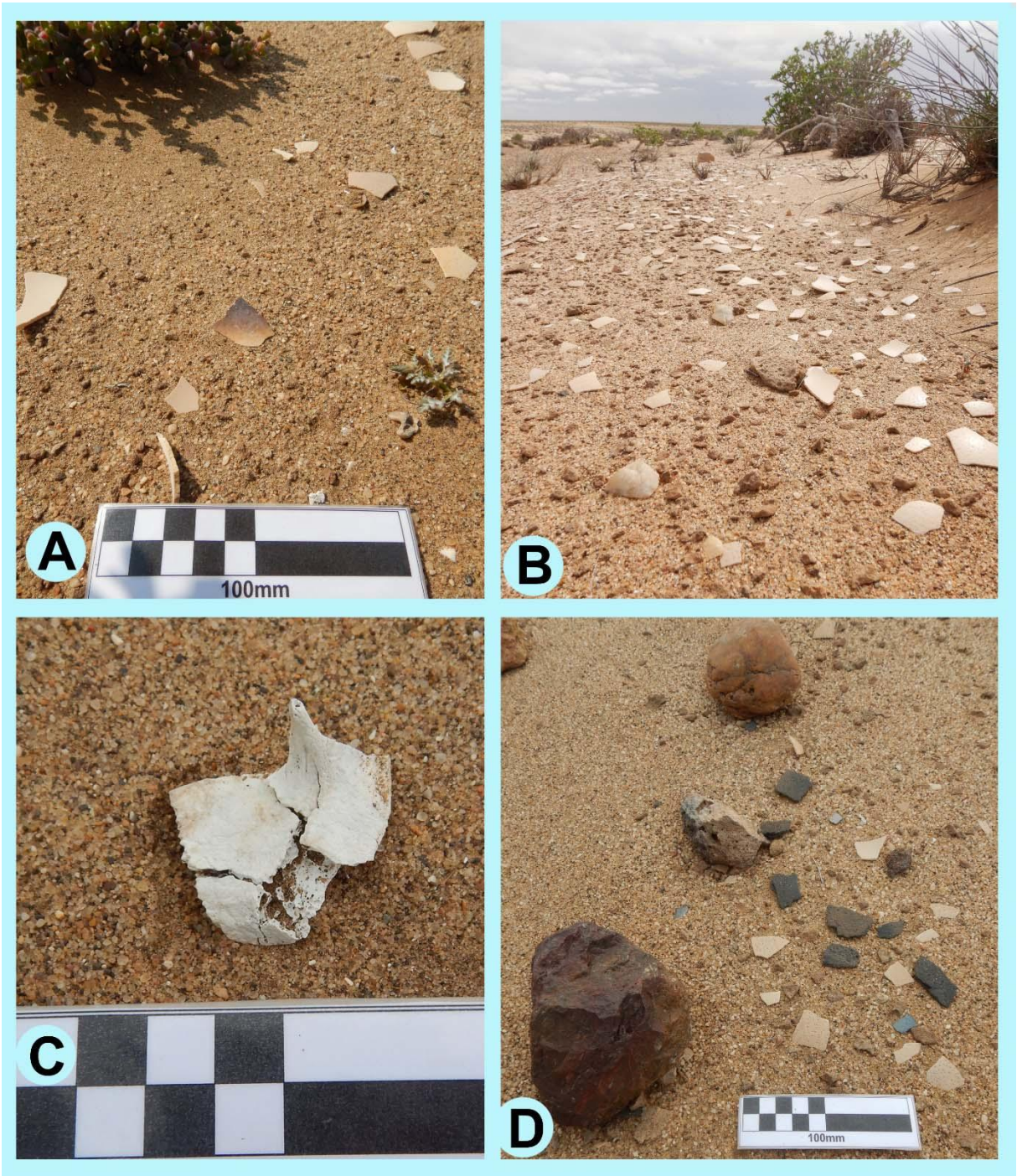

Figure 7. Faunal and archaeological remains in the valley north of Kerbehuk, Namibia. A) Ostrich eggshells fragments, some of which have been burnt, B) terrace covered in ostrich eggshell fragments (possibly the remains of a nest) and some quartz stones. C) tortoise scute, D) surface concentration of potsherds, ostrich eggshells and hearth stones with thermal shock fabric.

The grindstone at the Kerbehuk site is a large angular block of black rock, on the upper surface of which is a capacious but shallow depression that has been worn smooth by the action of grinding (Fig. 6A). A foot or two away from it there is a brown cylindrical stone which has a broad groove round it towards one end (Fig. 6A). The latter stone resembles tethering stones from various sites in Africa and the Middle East, but it could also represent a stone weight used to anchor mat huts using ropes (Webley, 1984; Orton, 2012a).

There are abundant fist-sized stones (milky vein quartz is the most abundant) in the

area, some of which have been chipped at one end (Fig. 6B).

Two of the potsherds from Kerbehuk are decorated and others are plain and smooth (Fig. 7D). One preserves a single row of pecked depressions, the other has two sub-parallel rows of similar depressions (Fig. 6C).

The commonest faunal remains noted at the Kerbehuk site comprise shells of *Patella* and *Ostrea*, presumably representing the debris left over from foraging trips to the coast which is 7 km away (Fig. 6E). Ostrich eggshells are also abundant, many of which show signs of burning (Fig. 6D, 6F, 7A). No beads were observed, but search time was limited. Of interest was the recognition of tortoise bones (Fig; 7C), some of which had been burnt. Orton (2012b) described tortoise burials in Namaqualand.

Discussion

Despite the time limitations that prevented an in-depth appreciation of the archaeological remains, it seems from what was exposed at the surface in the valley north of Kerbehuk, that humans occupied the area in permanent or semi-permanent settlements. There is water seepage in the area today (albeit salty and sporadic), so it is inferred that there may have been a more active seepage or spring in the vicinity at the time that humans lived there, implying a somewhat more humid climate (steppe) than exists in the region at present (desert with occasional winter rainfall).

The presence of large grindstones and a possible tethering stone or a stone for anchoring mat huts, together with decorated potsherds are suggestive of settled communities, with people possibly occupying the sites on a seasonal basis. Burnt bones and ostrich eggshells together with hearth-stones that show thermal shock fabric, indicate the use of fire for cooking, while the abundance of oyster and *Patella* shells indicates seashore foraging. The seashore closest to the site is 7 km away.

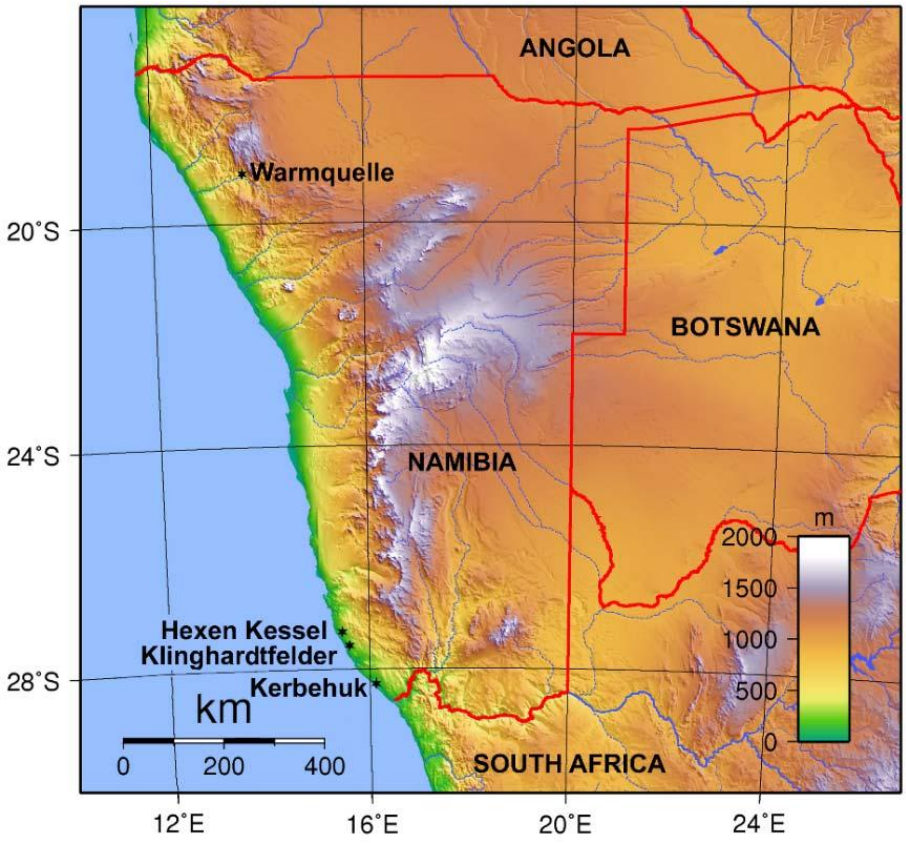

Figure 8. Location of Kerbehuk and other Namibian archaeological sites mentioned in the text.

Comparable behaviour patterns have been proposed on the basis of archaeological and faunal remains found at other sites in the Sperrgebiet, such as Hexen Kessel (Pickford & Senut, 2016; Pickford *et al*. 2018) and Klinghardtfelder (Senut *et al*. 2019) (Fig. 7) where the archaeological remains also occur close to areas where there are saline water seepages today, but the Kerbehuk site is the first one to have yielded decorated potsherds.

Chronological perspective

The oldest reported grindstones in Africa date from ca 100,000 years ago (Shoemaker *et al*. 2017) and they are still in use today in many parts of the continent. The earliest known occurrences of pottery in southern Africa are considerably younger than this (Dewar, 2008; Orton, 2012a). The Kerbehuk decorated potsherds resemble specimens from sites such as KN 2004/012 and SK2005/074A in Namaqualand, South Africa, (Orton, 2012a) dated to ca 1579 ± 24 BP (i.e. AD 432-606) and 400 ± 22 (i.e. AD 1455-1625) respectively, and early pottery was recorded from Warmquelle in Kaokoland, Namibia, aged ca 350 BC-AD 49 (Kinahan, 1981). Thus even though the contexts of the artefacts and pottery at Kerbehuk require confirmation by *in situ* excavations, they suggest a latest Holocene occupation of the area by humans, and by extension, it is inferred that the stratified sands and calc-crust layers accumulated about 2,000 or fewer years ago.

Conclusions

If the stone artefacts and pottery at the Kerbehuk site are contemporaneous, and if they are *in situ* in the stratified sands (a point that requires onsite investigation by excavation to demonstrate clearly) then, from a chronological point of view, the stratified sands and calc-crusts at Kerbehuk would seem to have accumulated in the recent past, perhaps 2,000 or fewer years ago. Proper archaeological investigation and radio-isotopic dating of burnt bone and eggshell is required to refine what is, from an archaeological perspective, rather an imprecise estimate of the age of the sediments. The interlayering of fine sands and calcareous crusts implies climatic fluctuations during the past few thousand years, but details need to be worked out by further research.

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