Burg et Tuyur 80/64 site in Northern Sudan

موقع برج الطيور 64/80 بشمال السودان

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Abstract

Eastern Sahara witnessed during its history several climatic changes from glacial ages to humid weather which attracted human and animal migrations from the Nile valley to settle in the desert. Now eastern Sahara is one of the most arid parts across the globe. The area of Selima Sandsheet and the Nubian desert in general is poorly studied, but recently in the last few decades the interest in study the Nubian desert began to increase. The area of Burg et Tuyur and Selima Sandsheet yielded many finds that enabled the researchers to draw a picture about the past history of the area and its Palaeofauna and flora. Burg et Tuyur 80/64 site in Selima Sandsheet in Northern Sudan is one of the prominent sites in the Nubian western desert. The site was discovered and excavated in the 80s by Members of the B.O.S members along with many other sites in Egypt and Sudan. The history of the sites extends over a huge time span and the finds includes lithics, Pottery, and rock art.

Keywords: Eastern Sahara, Nubian desert, Selima Oasis, Burg et Tuyur, Prehistory, Early Holocene, Environmental archaeology, Stone Artefacts

الملخص

شهد شرق الصحراء الكبرى خلال تاريخه العديد من التغيرات المناخية من العصور الجليدية الى الطقس الرطب والذي جذب الهجرات البشرية والحيوانية من وادي النيل ليستقروا في الصحراء. الآن تعتبر المنطقة من أكثر المناطق جفافا في العالم. لم يتم دراسة واحة سليمة والصحراء النوبية عامة بشكل كاف، ولكن في العقود القليلة الماضية زاد الاهتمام لدراستهما. شهدت منطقتا برج الطيور وواحة سليمة العديد من الاكتشافات التي ساعدت الباحثين على رسم صورة عن تاريخ المنطقة والحيوانات والنباتات القديمة بهما. إن الموقع الاثري برج الطيور 64/80 في واحة سليمة بشمال السودان واحدا من المواقع الرائدة في صحراء النوبة الغربية والذي تم اكتشافه والتنقيب به في ثمانينيات القرن الماضي بواسطة أعضاء مشروع B.O.S الى جانب العديد من المواقع الأخرى في مصر والسودان. يمتد تاريخ الموقع عبر فترة زمنية طويلة وتضمنت الاكتشافات الأدوات الحجرية والفخار والرسوم الصخرية.

الكلمات الدالة: شرق الصحراء الكبرى، الصحراء النوبية، واحة سليمة، برج الطيور، ما قبل التاريخ، أوائل الهولوسين، علوم البيئة الآثارية، الأدوات الحجرية.

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1. Introduction:

Today the Eastern Sahara is considered the most arid part of the whole Sahara with almost no rainfall and almost complete absence of human occupation, and vegetation except for the oasis. Looking closer to this part, numerous archaeological sites can be found from the archaeological traces on the surface[2].

Through the long history of the Eastern Sahara, it witnessed a robust climatic change that turned the void desert into a habitable Savanna-like environment. This climatic transformation attracted the animals from the Nile valley and were followed by people who used to hunt, gathered, and foraged. Settling in the vicinity of water tables, vegetation, and animal resources, desert dwellers adapted to the harsh living conditions. To make their life much easier, they produced stone tools and other products to help them conduct their daily activities, hunting and food processing.

Burg et Tuyur 80/64 Site is one of the prominent prehistoric sites of Selima Sandsheet, which is located in Northern Sudan. The site was first discovered in 1980s in the frame of the B.O.S Project (Besiedlungsgeschichte der Ost-Sahara) leading by Dr. Rudolph Kuper. The preliminary studies of 80/64 site showed that the site represents an early Holocene settlement, but no absolute dating was obtained. The previous dating is based on many archaeological materials as stone artefacts, pottery sherds and Rock art.

2. Location:

The Eastern Sahara covers more than 92,000,000 km2 and includes the Egyptian Western Desert, Northwest Sudan, and some parts of Libya and Chad[3]. The Selima Sandsheet is a flat contourless sandplain, located about 150 km to the west of the Nile Valley and covers a big area of the western desert and northwest Sudan on both sides. Overall, it covers an area of approximately 60,000 km2[4]. Fig.1

[2] Neumann, Katharina. "Holocene vegetation of the Eastern Sahara: charcoal from prehistoric sites." *African Archaeological Review* 7, no. 1, 1989: 97-99. ,Kuper, Rudolph. "After 5000 BC: The Libyan desert in transition." *Comptes Rendus Palevol* 5, no. 1-2, 2006: 409.

[3] Kuper, Rudolph, & Kröpelin, Stefan. "Climate-controlled Holocene occupation in the Sahara: motor of Africa's evolution. " *Science, 313*(5788), 2006: 803

[4] IDRIS, Gamal. "Burg et. Tuyur Fundplätze 85/78 und 85/79. Ein Beitrag zur steinzeitlichen Besiedlung der Selima Sandsheet" (Master dissertation, Köln), 1988: 2; Schuck, Werner. "An archaeological survey of the Selima Sandsheet, Sudan." *Environmental change and human culture in the Nile Basin and Northern Africa until the Second Millennium BC*, Poznan Archaeological Museum, Poznan, 1993: 237.

The void, uninhabited Selima oasis (21°22.2'N, 29°18.6'E) in northern Sudan is a partly vegetated depression extending NW-SE for 7 km along the base of a 90 m high escarpment of Mesozoic sandstone[5].

It also gained more importance since it is located on one of the main ancient traffic routes known as the Darb El-Arba'in which used to link Middle Egypt with the Darfur region in Sudan and was in use probably since Pharaonic times[6].

Burg Et-Tuyur ("20˚ 55.4'N, 27˚ 41.1'E")- is located in that area within the Selima Sandsheet. Approximately in the middle between the Nile and the Sudanese - Libyan borders

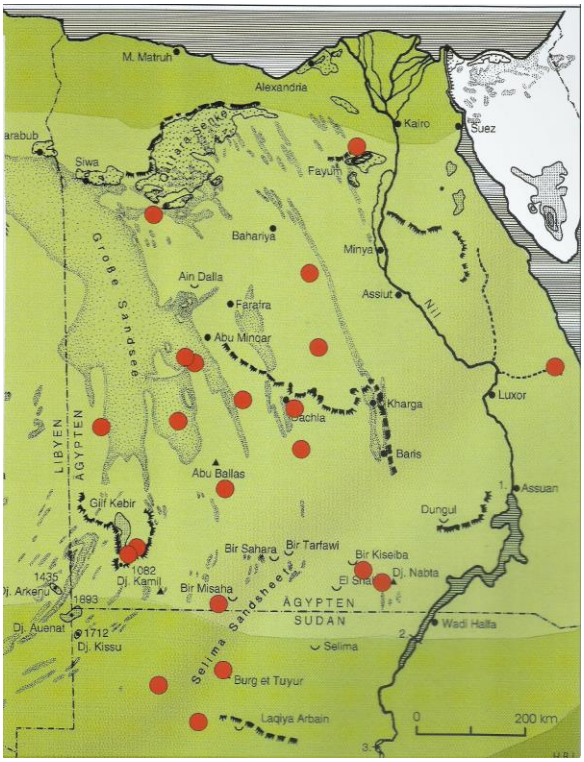

Fig. 1: A Map showing Selima Sandsheet and Burg et Tuyur in Northern Sudan. After (Kuper,2002, p.259)

3. Archaeological Work at Burg et Tuyur

3.1 Research history

The last 40 years have witnessed a growing interest in prehistoric archaeology in Egypt and Sudan after it was slowly developed during the last century. Organized and systematic archaeological research started in the 1920s when desert exploration was common mostly by members of geographical surveys[7]

[5] Haynes Jr, C. V., Eyles, C. H., Pavlish, L. A., Ritchie, J. C., &Rybak, M. "Holocene palaeoecology of the eastern Sahara; Selima Oasis. " *Quaternary Science Reviews*, *8*(2), . 1989: 110.

[6] Jesse, Friederike, Gradel, Coralie, & Derrien, Frank. "Archaeology at Selima Oasis, Northern Sudan–recent research. " *Sudan & Nubia*, *19*, 2015: 161

[7] Riemer, Heiko, Lange, Mathias, and Kindermann, Karin, "When the desert dried up: late prehistoric cultures and contacts in Egypt and northern Sudan." *Raue, D. et al* ,2013: 157.

In 1927, Newbold and Shaw, and other companies took a Camel ride into the south Libyan desert to explore this poorly surveyed area. They started their journey from El-Obeid (Kordofan) via Nukheila passing by the Selima Oasis to the Nile Valley. In 12. December, they reached an area characterized by several dunes with a prominent Rock. Newbold described the rock as it stands on a low sand ridge that raised to 7.6 meters. The rock is composed of hard smooth sandstone. It was a stopping point for migrant birds as they found dozens of dead birds around the rock, semi-petrified faeces, and a large nest for hawks; therefore, they named it Burg et Tuyur (the hill of birds). They also noted the rock painting of an ox and collected a pestle and ostrich eggshells that were a direct indication for ancient settlement in the area.[8]

In 1933, H. Rhotert visited Burg et Tuyur with the Frobenius Expedition and mentioned the drawing and the artefacts lying around the hill. For a long time, these two publications were the only source for any information about the area until the discovery of underground flow systems by the radar images which revealed numbers of buried and unknown features[9].

In 1980, a new project funded by the DFG started; it was called B.O.S or the history of settlement in the eastern Sahara and lasted until 1993. There was almost no systematic research carried out in the far west of Egypt and Sudan before this project, only some findings, and observations from earlier explorers. The project aims to study the cultural traditions development, landscape, their chronology, and life forms within the climate change in the eastern Sahara in interdisciplinary scientific cooperation. A massive area was covered during the project (1200 Km long transect) running from the Mediterranean in the north to the Sahel zone in the south and it involved long-range surveys and several excavations. 7 Major areas were chosen to be focused on more, and these areas are Siwa and Qattara depression, Great Sand Sea, Abu Ballas region, Gilf Kebir, Selima Sandsheet, Laqiya region, and Wadi Howar. (Fig. 2).

[8] Newbold, D., and William Boyd Kennedy Shaw. "An exploration in the south Libyan desert." *Sudan notes and records* 11, 1928: 103-194.

[9] Wendorf, Fred, & Close, Angela E. "An archaeological survey near Bir Safsaf, eastern Sahara. " Cahiers ORSTOM. Série Géologie, 14(2), 1984:194. , Idris, Gamal, Burg et. Tuyur Fundplätze 85/78 und 85/79: 2

This long transect guaranteed a connection between the winter rain in the north and possible tropical summer rain in the south and the middle, there is the highest aridity in the entire Sahara. During the project, more than 500 archaeological sites were recorded while excavation was carried out in 200 sites[10].

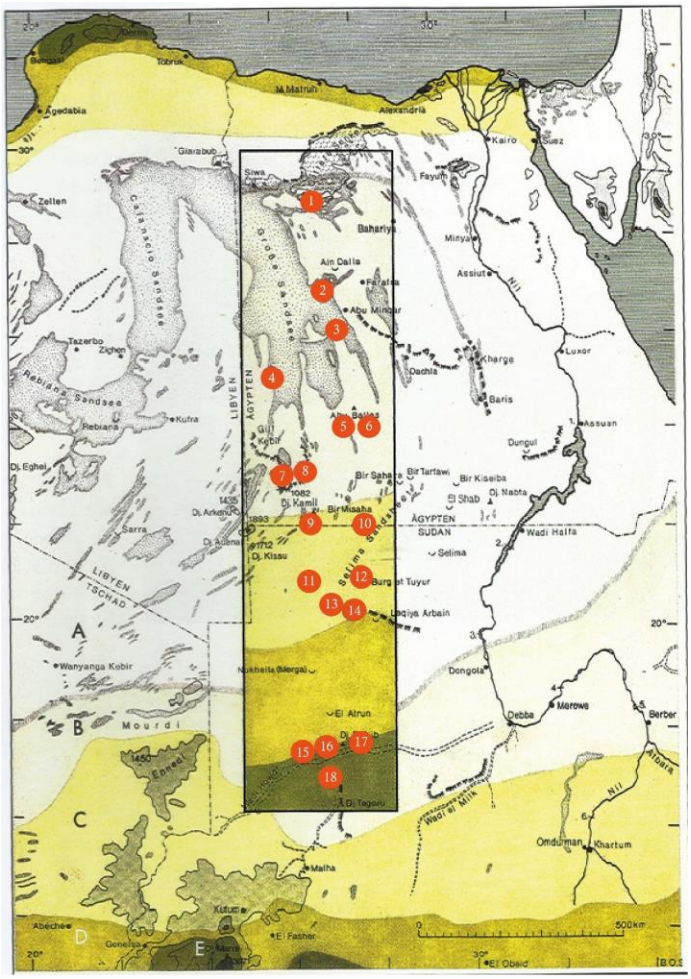

Fig. 2: A transect shows the areas in which B.O.S expedition worked in the eastern Sahara, 1: Qattara / Siwa 2-4: Great Sand Sea 5-6: Abu Ballas Area 7-8: Gilf Kebir 9-12: Selima Sandsheet 13-14 Laqiya Region 15-18: Wadi Howar The colour Gradient represents a reconstruction of the northward shift of the Sahelian vegetation at around 7000 – 6500 c. bp from scattered desert vegetation in Egypt to acacia desert scrub to thorn Savanna to finally deciduous Savanna. (After Kuper, 2002).

During the survey in1983, many surface Neolithic sites were recorded in the basin, but one test pit excavation was done in a rock shelter where there were artefacts, potsherds, and other finds on the surface. The pit depth reached 40 cm. The promising test pit was a big motive for extensive research in the area in 1985 and contiguous areas that ended with adding some other prehistoric sites, so it ended up with a total of 27 sites discovered, and 10 sites were partly excavated. A few radiocarbon dates were obtained from ostrich eggshells found on some sites in the area.

[10] Kuper, Rudolph, "Prehistoric research in the Southern Libyan Desert. A brief account and some conclusions of the BOS project." *Cahier de Recherches de l'Institut de Papyrologie et d'Egyptologie de Lille* 17, 1995: 123; Kuper, Rudolph, "Routes and roots roots in Egypt's Western Desert: The early Holocene resettlement of the Eastern Sahara." In R. Friedman (ed.) *Egypt and Nubia. Gifts of the desert*, 1-12. British Museum Press, 2002: 2. , Project report, 2003 ; Riemer, Heiko, et al., When the desert dried up: 157.

These sited dated between (KN-4301) 6520±70 to (KN-3975) 4310±65 B.P and corresponds to other settlements times in adjacent Wadi Shaw and Wadi Al-Akhdar[11]

In Bir Misaha, several sites were recorded, some of them were huge sites. Concentrations of artefacts were found including segments, blades, a large number of gravers, and partially retouched needle bladelet. Some of the pottery sherds were undecorated thick-walled with organic temper, also a large sherd with dotted wavy line decoration was present. The team could collect charcoal samples from one of the sites (Retrieved from iDAI.objects Arachne on Feb. 8.2022).

In Westend, large open-air sites were found where concentrations of artefacts were discovered on the surface, and in one site finds were embedded up to at least 10 cm in the sediment. The lithic technology included both unretouched and retouched artefacts. Grinding stones were also present in many sites. Samples of charcoal were taken from some of the sites. (Retrieved from iDAI.objects Arachne on Feb. 8.2022).

Burg et Tuyur area was visited rapidly during the early stages of the B.O.S project as a promising point in 1980 while heading to the working areas in North Sudan (Laqiya area and Wadi Howar). In 1983, the expedition members discovered 40 sites on their way to Wadi Shaw and that was the main reason for extensive survey later to fill the gap in the transect of the B.O.S research area. In 1985, a comprehensive survey was conducted in the vicinity of Burg et Tuyur Rock. The northernmost corner of the excavation was 45 km and 10 km to the south (55x30 km) with a total of 1200 sq. km. 285 sites were discovered and recorded ranging from small artefacts scatters to massive sites up to 100 000 sq. m. Test excavation provided clues that intensive settlements activities have taken place in the area[12].

3.3 Excavation work at Burg et Tuyur 80/64

Burg et-Tuyur 80/64 site is located directly at the rock. During B.O.S work in 1983, test excavation was done and extended in 1984 and 1985. In 1984, two test excavations were

[11] Hahn, Joachim. "Neolithic settlement patterns in the Gebel Kamil area, southwestern Egypt." *Environmental Change and Human Culture in the Nile Basin and Northern Africa Until the Second Millennium BC. Poznan: Poznan Archaeological Museum,* 1993: 226.

[12] Idris, Gamal, Burg et. Tuyur Fundplätze 85/78 und 85/79: 3; Schuck, Werner, An archaeological survey of the Selima Sandsheet, Sudan: 237-239; Kuper, Rudolph, "Prehistoric research in the Southern Libyan Desert: 126.

dug with a depth of about 20 cm in which the team found stone artefacts, charcoal, and burned bones.

In 1985, a systematic excavation was done by Klaus Bokelmann, Gunther Damm, Jörg Eckert, Sharon Günther, Jamal Idris, Anke Kuper, Werner Schuck and Wim van Neer. Three excavation pits were dug during this year (fig. 3) :

Excavation pit 1: on the eastern side of the rock, the team noticed scatters of artefacts made mostly with quartzite and chalcedony. There were also eroded pottery sherds. The pit that was dug last season was extended and dug to the depth of 1.50 m exposing 21 strata each about 5 cm thick. There were collapses and large boulders in the dug area that must have happened before or during Middle Palaeolithic time which resulted in narrowing the area of excavation. Soil samples were collected for future study. Well, defined Levallois technique was present in the stone inventory in the lowest part of the dug area. Pottery sherds found belonged to three phases, the oldest of them is confirmed by the Laqiya type decoration. (fig. 4)

Excavation pit 2: B.O.S expedition members discovered a long narrow scatter of artefacts along the rock. They dug a test pit in 1984 then extended it in 1985. Numerous microlithic artefacts were measured independently. Many pottery sherds were found along with the stone artefacts.

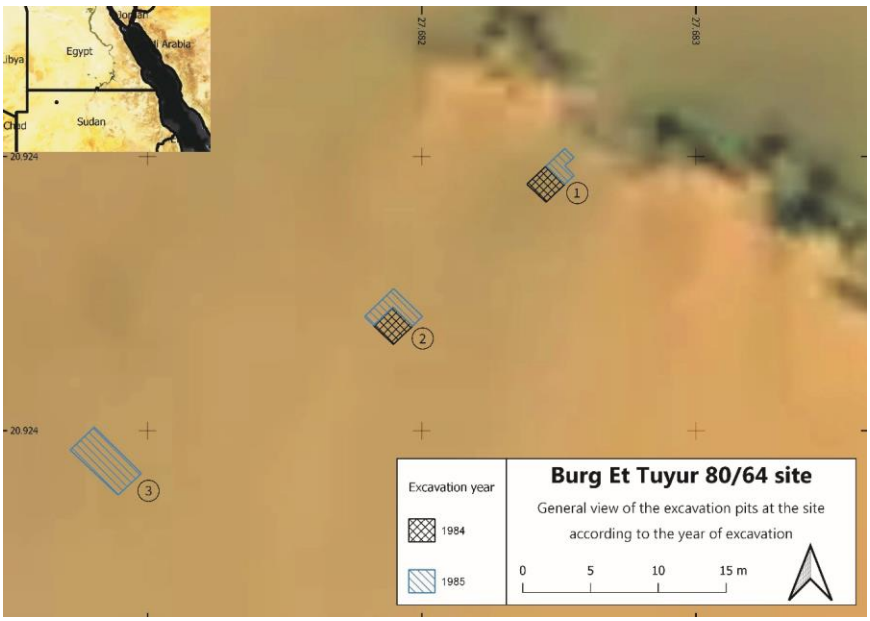

Fig. 3: Map shows excavation pits according to the year of excavation. Made by the author. Satellite Image Source: Google Earth

Excavation pit 3: there was a scatter of artefacts in a 12 sqm area to the south of the two pits mentioned earlier. A comprehensive surface survey was done, and the finds were measured and recorded individually. Then 2x5 m area was dug to recover the material that lay in the drift sand and up to immediately above the dark brown dune sand in which the finds from excavation 80/64-1 were found. (Fig. 5)

Fig. 4: Excavation pit 1 during the digging work (photo: R. Kuper)

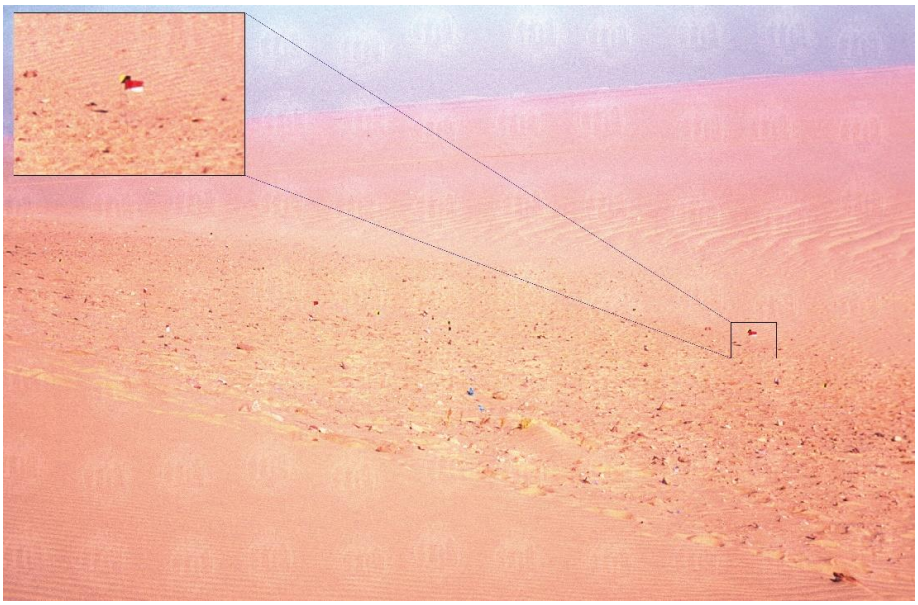

Fig. 5: Photo shows the individual recording of the artefacts in their exact position. Slightly modified (Photo: R. Kuper)

3.4 The archaeological material

It is worth to note that the archaeological material of this site has not been studied yet and the following descriptions is only from the personal observation of the Excavation team in situ.

3.4.1 Lithics:

The site is dominated by microlithic made with quartzite and Chalcedony. Segments are prominent in the lithic inventory including very narrow forms with flat or thick backs. lamellae, fragments, and long narrow triangles are also common as well as notch residues. In fewer quantities, trapezoids, triangles, drills, end retouch, and microtips are presented. Worked cores are also present in the inventory (Fig. 6 A)

3.4.2 Pottery:

Several pottery sherds were found during the work in the 80/64 site. The oldest one belonged to the Laqiya type. The team also found some sherds with signs of erosion that probably come from four vessels. Some of the sherds are undecorated, and rim sherds are not present. Two sherds belong to an older horizon (maybe Middle Neolithic) and other sherds are of younger dates. The team also found eight sherds, which are relatively hard-fired, leathery brown on the outside, and well smoothed. They correspond to the sherds from site 82/33-41 in Wadi Shaw. Three sherds with quartz leanings cannot be further classified, twelve others can be separated from the other sherds by their leanings - sand, quartz, organic components (Fig. 6 B)

3.4.3 Rock art:

Early explorers who visited the rock have mentioned the cattle drawing on the rock like Newbold and Shaw in 1927 and H.Rhotert with the Frobenius Expedition[13]. When the B.O.S expedition visited the rock in 1982, they immediately noticed the drawing and beside it tiny lines of an incomplete cow. (Fig. 7)

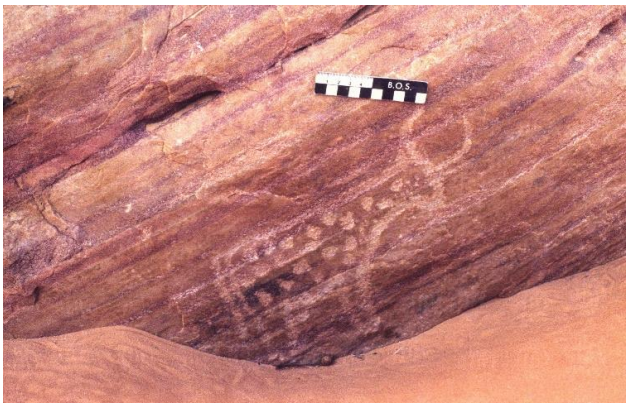

Fig. 7: The drawing of the cow on the rock of Burg et Tuyur (Photo: R. Kuper)

[13] Newbold, D., Shaw, William Boyd Kennedy, An exploration in the south Libyan desert: 124.; Rhotert, H, "Libysche felsbilder: Ergebnisse der XI und XII Deutschen Inner-Afrikanischen Forschungs-expedition" (Diafe) 1933-1934-1935, LC Wittich, 1952.

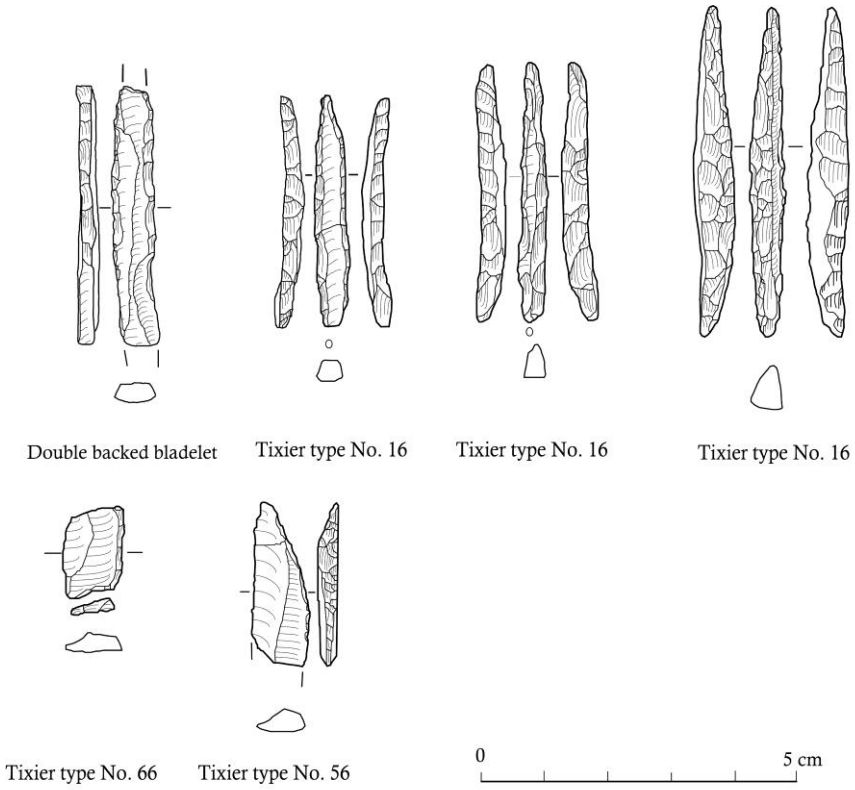

Fig. 6 A: Tools found at excavation pit 3

Fig 6 B: 3 pottery sherds found on the site. Photo: courtesy of B.O.S project.

4. Geographical settings

The Selima Sandsheet consists of aeolian sand and a huge flood plain. In its southern parts, there are some dunes and Barchan dunes of 10 to 15 m. Selima oasis is bounded by an escarpment from the northeast side formed between the Jurassic to middle Cretaceous age (Selima Formation) and its benches have continuously eroded through time. The depression is cup-shaped for almost 1.6 km in length. This range of hills cuts off the north wind which makes Selima oasis a very hot place during the daytime and at night the air becomes heavy and oppressive. The south-eastern floor of the depression has some yardangs sandstone hills elongated nearly N10°E with the dominant wind direction[14].

The thickness of ripple extent in the Selima Sandsheet varies from 1cm to many decimetres and on some rare occasions reaches the depth of 1 m, but in the region of Burg et-Tuyur and Bagnold's Barchan, the thickness could reach 10 m[15].

Burg et-Tuyur is considered an isolated rock island and the only landmark in the south of Selima Sandsheet (Haynes, 1982; Idris, 1989) [16](Fig. 8).

Fig. 8: A photo of Burg et-Tuyur rock island in Selima Sandsheet.

Retrieved from AAArC (African Archaeology Archive Cologne) on Jan.21.2021

[14] Leach, T. A., G. W. Grabham, and F. Addison. "The Selima Oasis." *Sudan Notes and Records* 9, no. 2, 1926: 39-40; Haynes Jr, C. Vance. "Great sand sea and Selima sand sheet, Eastern Sahara: geochronology of desertification." *Science* 217, no. 4560, 1982: 631. ; Haynes Jr, C. V, et al.,Holocene palaeoecology of the eastern Sahara: 111.

[15] Maxwell, Ted A., Haynes, Vance Jr C., "Sand sheet dynamics and Quaternary landscape evolution of the Selima Sand Sheet, southern Egypt." *Quaternary Science Reviews* 20, no. 15, 2001: 1626.

[16] Haynes Jr, C. Vance, Great sand sea: 631 ; Idris, Gamal, Burg et. Tuyur Fundplätze 85/78 und 85/79: 2.

Selima Basin – located in the cup-shaped depression - consists of the main basin and many smaller sub-basins. The basin is surrounded at the northeast side by a 90 m high escarpment belongs to Selima Formation and is bordered to the southwest by a beach terrace located 15 – 17 m above the present-day floor. It is covered by a thick network of fossilized tree roots, but that margin is indefinite as the basin floor gradually rises in that direction due to deflation, probably augmented by salt weathering during several episodes of climatic change in the Quaternary[17].

Another important economic aspect of Selima Sandsheet is the salt mines, according to Leach,1926, Production of salt was limited to the demand as the salt market at this time was small. The salt mines are outside Selima Oasis at about 1.6 km from its centre and the rock- salt was not found on the surface but nearly a meter down under another rock which was covered with loose sand.[18]

5. Palaeofauna and flora of the Selima Sandsheet

During the Holocene wet Phase, grassy vegetation covered the stabilized aeolian sands in many areas, including Selima Sandsheet[19].

Vegetation in Selima is restricted to the main basin only- where there is an open well in the central area- and is supported by the moisture held in saturated lakebeds of early to middle Holocene age that form the floor of the main basin[20]

Selima Sandsheet with almost no rainfall or vegetation except for occasional patches of grass (usually *stipagrostis sp.*), shrubs (*cornulaca monacantha*), or small trees (*capparis decidua, salvadora, maerua crassifolia*) but in the oasis, the high water support some species such as few trees of *hyphaene thebaica* (the doum palm, probably native here) occur in the centre of the oasis, along with many more introduced date palms (*phoenix dactylifera*). Sand dunes support abundant shrubs of *tamarix nilotica*. Damp soil near the well, where the water table is about 1 m below the surface, supports dense stands of (*demostachya bipinnata, lmperata cylindrica, Juncus rigidus, and sporobolus spicatus*).

[17] Pachur, H-J., H-P. Röper, Stefan Kroepelin, and Michael Goschin. "Late Quaternary hydrography of the eastern Sahara.", 1987: 344. ; Haynes et al., Holocene palaeoecology of the eastern Sahara: 111-112.
[18] Leach, The Selima Oasis: 42-43.
[19] Nicoll, Kathleen. "Recent environmental change and prehistoric human activity in Egypt and Northern Sudan." *Quaternary Science Reviews* 23, no. 5-6, 2004: 566.
[20] Haynes et al., Holocene palaeoecology of the eastern Sahara: 112

Local occurrences of (*phragmites australis* and *cynodon dactylon*) were also noted[21]. In 1903, 2000- 2500 date palms existed in Selima Sandsheet while in November 2011, only about 1600 palms were there and about 542 were dead[22].

During the early to middle Holocene, a moderately wooded steppe desert colonized the Selima Oasis as proposed by the pollen spectra. Pollen records also indicate that the Sahelian and the Sudanese vegetation in Selima continued until approx. 6840 cal. Bp[23] and the drying conditions began around the start of the sixth millennium Bp. Around 5150 cal. BP in southern Egypt and northern Sudan, the once extant flora of desert scrub grassland disappeared at most places except for some oasis and wadies allowing sand to mobilize across the region[24].

B.O.S expedition collected 22 charcoal samples from the area of Burg et Tuyur, these samples dated between 6840 and 6500 cal. bp, and yielded an assemblage of the following nine taxa: *Acacia sp., Acacia albida, Maerua crassifolia, Leptadenia pyrotechnica, Ziziphus sp., Boscia senegalensis, Balanites aegyptiaca, cf. Cassia senna, and Chenopodiaceae*.

In Sudan, the Sahelian savannas including the same species as the ones found in the Burg et Tuyur samples are called 'Acacia desert scrub'. The floral situation at Burg et Tuyur around 6500 cal. BP can be compared with the current dune formation in northern Darfur and northern Kordofan. However, the density of tree growth on the dunes can't serve as a model for the middle Holocene in Selima Sandsheet because it has been severely modified by human activity over the last decades. (Fig. 9).

The existence of *Acacia albida* in the charcoal samples refers to relatively high groundwater at Burg et Tuyur. In general, this species is regarded as a trustable indicator for groundwater[25].

Fauna remains in Burg et Tuyur were not very common except for some species found in a site in the area as Ostrich (*struthio camelus*), wild cat (*felis silvestris*), giraffes (*giraffa*

[21] Haynes et al., Holocene palaeoecology of the eastern Sahara: 112; Kuper, Rudolph, After 5000 BC: 409-410.
[22] Leach, The Selima Oasis: 41; Jesse, Friederike, et al., Archaeology at Selima Oasis:163.
[23] "Laboratory dates were calibrated using CalPal 2-D dispersion calibration, version 2021.4, WENINGER & JÖRIS, 2008, with the Intcal2020 dataset, REIMER et al. 2020."
[24] Nicoll, Kathleen, Recent environmental change: 565.
[25] Neumann, Katharina, Holocene vegetation of the Eastern Sahara:106-107.

camelopardalis), dorcas gazelle (*gazella dorcas*), dama gazelle (*gazella dama*), oryx (*oryxdammah*), sheep (*ammotragus lervia*), goat (*capra aegagrus f.hircus*), rhinoceros (*diceros bicornis*), and tortoises (*geochelone*) which were found in two sites in Burg et Tuyur and were dated to 5530 B.C[26]

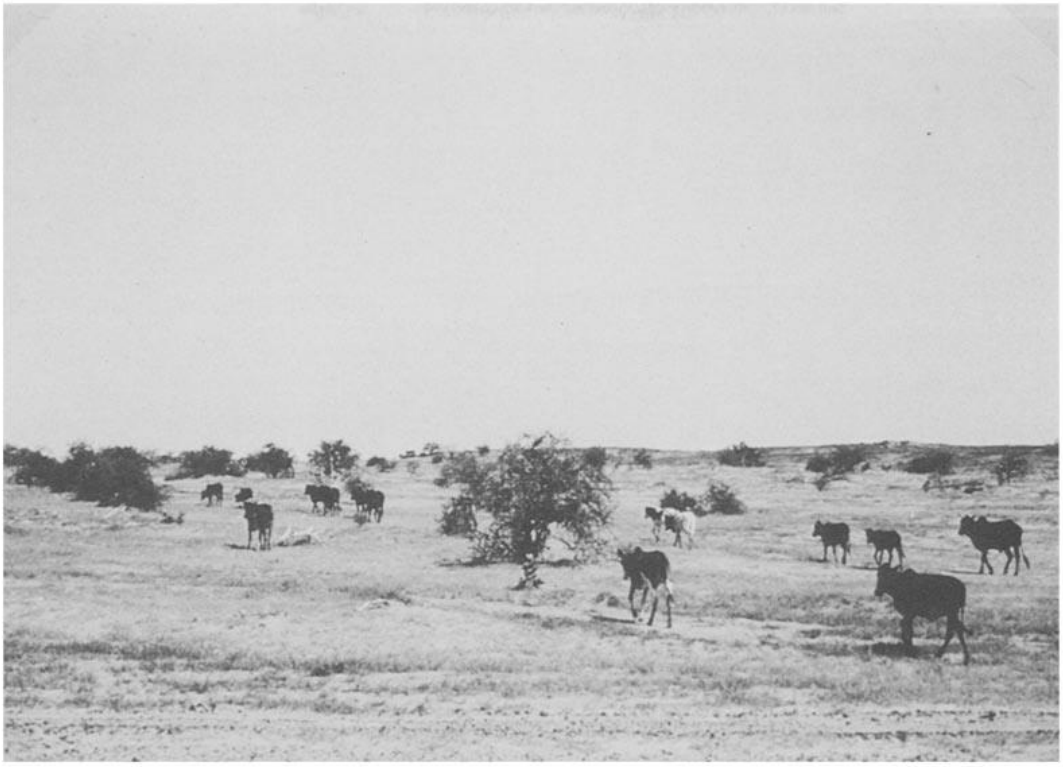

Fig. 9: A comparable vegetation for Burg et Tuyur around 6500 cal. BP: Acacia desert scrub at Abalak in Niger. (After Neumann, 1989, 107)

6. Palaeoclimate of Eastern Sahara:

During the terminal phase of Pleistocene, the Sahara within its core precipitation is with less than 5 mm per year extended 400 km further south than it is today and was completely void of any human presence due to the extreme aridity in contrary to the Nile Valley especially near Aswan south of Egypt. At the end of this period, the Nile River had significant changes because of the increased rainfall affecting the major headwater

[26] Van Neer, Wim, and Uerpmann, Hans-Peter, "Palaeoecological significance of the Holocene faunal remains of the BOS-missions.", 1989: 311-329.; Schuck, Werner, An archaeological survey of the Selima Sandsheet: 239; Le Quellec, Jean-Loïc, Pauline de Flers, and Philippe de Flers. "Peintures et gravures d'avant les pharaons: du Sahara au Nil." Collège de France, chaire de Civilisation pharaonique. Etudes d'égyptologie 7, 2005: 292-341.

catchment areas of the Nile, especially in the Ethiopian highlands causing harsh living conditions[27].

The Eastern Sahara had witnessed many climatic fluctuations as in the last nearly 12,000 years, the climate changed from being hyperarid to semi-arid then back again to its current hyperarid state. The monsoonal belt shifted around 700-1000 km northward and studies showed that the initial reason for that shift is the change in the Earth's orbital parameters that increased the amplitude of the seasonal cycle of solar radiation in the Northern Hemisphere[28]. (Fig.10)

This change in the tropical summer rain's location caused more humidity (annual rainfall raised to 100 – 150 mm) in the Eastern Sahara. The beginning of the Holocene wet phase is estimated between the end of the 12th century to the early start of the 11th-century cal. BP by studying initial playas and lacustrine deposits from Egypt and northern Sudan which corresponds with the earliest archaeological sites in the eastern Sahara. During this wet phase, grassy vegetation covered many areas including Selima Sandsheet. While the start of the drought of the Sahara starts around 6840 cal. BP and is linked by the southward retreat of the monsoonal summer rain belt[29]

Kuper and Kröpelin, 2006, divided the phases of human occupation in Eastern Sahara during the wet Holocene into four stages (fig. 11):

-Early Holocene reoccupation (8500 – 7000 B.C.E):

With the arrival of monsoon rains, the Eastern Sahara turned into a habitable Savannah-like environment and people who were already adapted to Savannah moved to the north following the rains. Probably the Nile inhabitants also moved into the desert because of the harsh environment in the Nile Valley. Those people were hunter-gatherers who may know animal husbandry.

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[27] Welsby, Derek A, Macklin, Mark. G. and Woodward, Jamie C. "Human responses to Holocene environmental changes in the Northern Dongola Reach of the Nile, Sudan." In *Egypt and Nubia: Gifts of the desert*, pp. 28-38. British Museum Press, 2002: 28. ; Kuper, Rudolph, After 5000 BC: 4.9-410.; Riemer, Heiko, et al., When the desert dried up: 159-160.

[28] Hoelzmann, Philipp, Kruse, Hans-Joachim, and Rottinger, Frank, "Precipitation estimates for the eastern Saharan palaeomonsoon based on a water balance model of the West Nubian Palaeolake Basin." *Global and Planetary Change* 26, no. 1-3, 2000: 105.; Bubenzer, Olaf, and Heiko Riemer, "Holocene climatic change and human settlement between the central Sahara and the Nile Valley: Archaeological and geomorphological results." *Geoarchaeology: An International Journal* 22, no. 6, 2007: 609.

[29] Nicoll, Kathleen, Recent environmental change: 564-566; Bubenzer, Olaf, and Heiko Riemer, Holocene climatic change and human settlement: 609.; Riemer, Heiko, et al., When the desert dried up: 159-160.

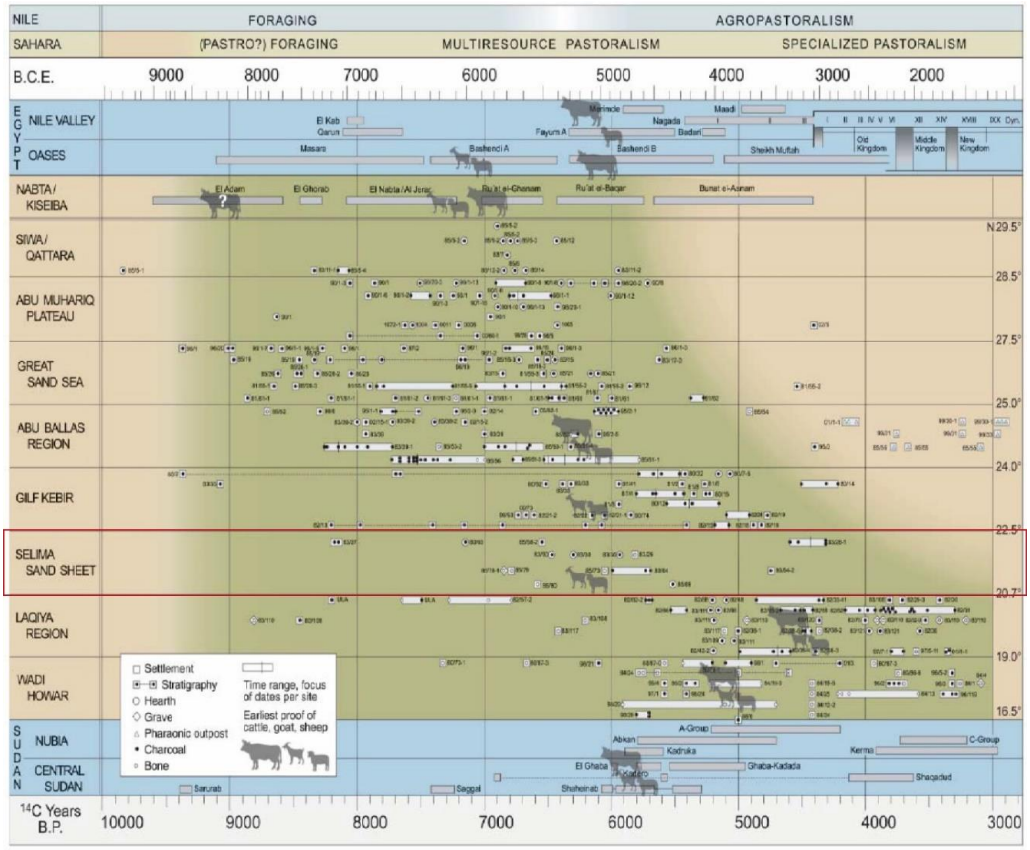

Fig. 10: Based on multiple radiocarbon dates from several sites in the Eastern Sahara, it becomes clear that there is a trend to southward shifting occupation which was driven by the retreat of monsoon rainfall, the figure also shows the appearance of the domesticates that was prevalent in each area (modified after (Kuper & Kröpelin, 2006)

-Mid – Holocene formation (7000 – 5300 B.C.E):

Human settlements became well established all over the Eastern Sahara and prehistoric people adapted very well to the economic and technological aspects of the different ecological demands. Evidence of goats and sheep domestication was present in some sites during this phase.

-Mid – Holocene regionalization (5300 – 3500 B.C.E):

The transformation of regions with permanent water, to extra-zonal ecological niches like the mountainous Gilf Kebir, the oases, the Nile Valley, and to the more southern Sudanese plains, where rainfall was still sufficient, promoted more regional cultural development. During this time people changed their lifestyle and subsistence it was supposed that they become sedentary pottery- producing farmers and livestock keepers

after being nomadic hunter-gatherers, but instead they changed into nomadic cattle herders. Apparently, Savannah was still providing a sufficient number of wild-growing grains, tubers, and fruits because cereal farming doesn't appear to be a component of the Saharan "Neolithic revolution". The exodus from the Sahara coincides with the rise of the first settled communities in the Nile Valley.

-Late Holocene Marginalization (3500 – 1500 B.C.E):

Rain during this period ceased even in the ecological niches like Gilf Kebir and proven permanent human settlements were only restricted to Northern Sudan, Egyptian oases, and the Nile valley. Dynastic Egypt was established in the Nile Valley since 3000 B.C.E, while in the Sudanese Sahara cattle herders still practiced their Neolithic lifestyle[30].

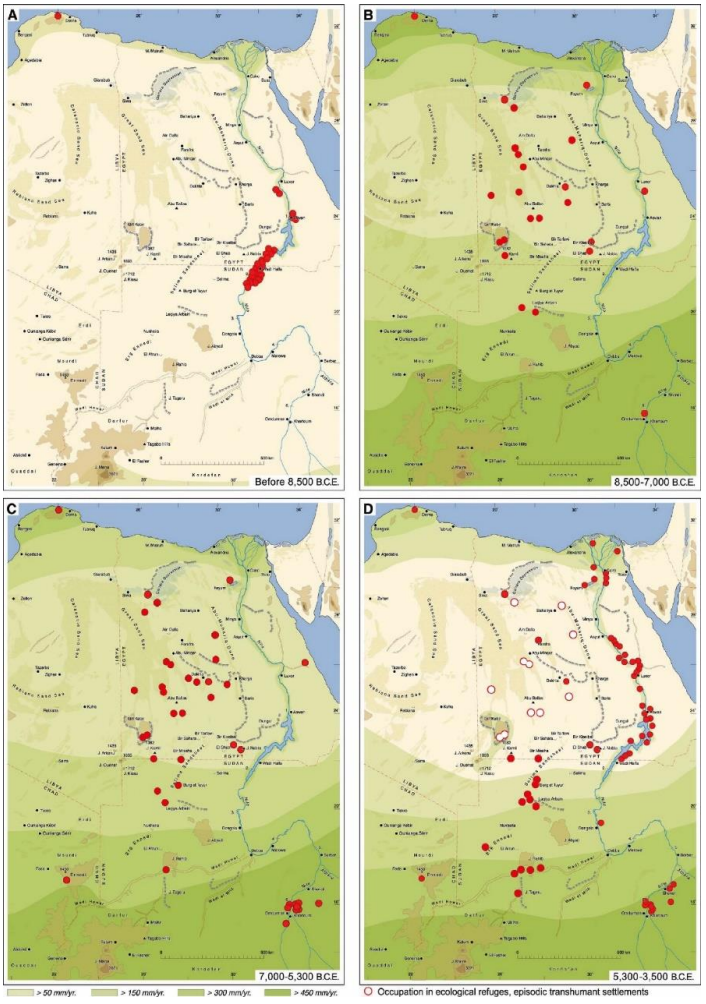

Fig. 11: Images show the stages of the human occupation in the Eastern Sahara before and during the Holocene. (A) Terminal Pleistocene before 8500 B.C.E (accumulation of sites at a certain part of the Nile Valley), (B) Early Holocene reoccupation, (C) Mid – Holocene Formation, (D) Mid – Holocene regionalization (After, Kuper & Kröpelin, 2006, p.806)

[30] Kuper, Rudolph, After 5000 BC: 412-417.; Kuper, Rudolph, Kröpelin, Stefan, Climate-controlled Holocene occupation in the Sahara :805-806.

Hundreds of radiocarbon dates gathered from different areas of the Western Desert of Egypt and Northern Sudan proved the wetter climatic condition and provided strong evidence of many playas across the desert. These playas were in Siwa, Faiyum, Farafra, Great Sand Sea, Kharga, Dakhla, Gilf Kebir, and Nabta-Kiseiba in Egypt while in the Sudanese part, playas existed in Selima Oasis, Laqiya, Oyo – Merge, Tageru Region, and Wadi Howar. (Fig. 12)

These radiocarbon dates clarified that the most surface water storage was between approx. 9040- 6840 yr. cal. BP which is linked to the intensified Afro-Asian monsoon. These climatic fluctuations played an important role in human settlements and activity in these areas[31].

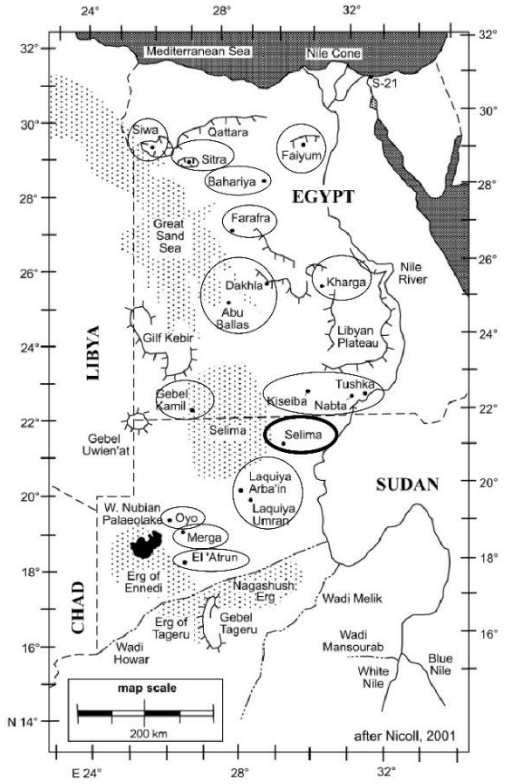

Fig. 12: A map shows the locations of the temporary water pools and environmental archives in East Sahara. (Modified after (Nicoll, 2001, 564)

6.1 Palaeoclimate of Selima Sandsheet

The Eastern Sahara witnessed the advent of wetter conditions creating rising water tables sufficient to support lakes around Northern Sudan around 10850 cal. BP[32]. The maximum rainfall throughout the Holocene at Selima is predicted via Haynes to

[31] Nicoll, Kathleen. "Radiocarbon chronologies for prehistoric human occupation and hydroclimatic change in Egypt and Northern Sudan." *Geoarchaeology: An International Journal* 16, no. 1, 2001: 47-64.
[32] Nicoll, Kathleen, Recent environmental change: 565.

200 mm/yr. or greater[33]. According to Kuper and Kröpelin, the Sudanese desert started drying out thousands of years after the Egyptian part of the Eastern Sahara[34].

Research conducted in Northern Sudan has proven that freshwater lake sediments are widespread over the area and dates back to the early to mid-Holocene. These open water bodies provided the appropriate living condition (supported the existence of flora and fauna nearby) for human settlements along their shores[35].

Selima lake:

Rising water tables were sufficient to support lakes at many localities in Sudan around 10850 cal. BP. Radiocarbon dates, pollen spectra, buried lake sediments, and tufa strandlines proved the existence of freshwater lake with mud formation in Selima Oasis depression northwestern Sudan[36].

The radiocarbon dates showed that the lake formed between pre 10391 ±116 and started to dry out periodically starting from around 6500 cal. BP. Because local rain has decreased and aridification progressed in Selima, the lake size reduced until finally desiccated around 4470 cal. BP. This date also can be supported by the burial found in the lake chalks which included Ostrich eggshell dated to 4470 ± 59 cal. BP[37].

The lake sediments can be found spreading over 16 km^2 in the Selima basin and as the morphological data showed, the lake depth may have reached from 16-19 m. since the lake shores produced younger radiocarbon dates, it is likely that the lake depth in the early stages was below this level. The base of the lake consists of sand of aeolian origin as proposed by the grain size distribution[38].

The long-term climatic conditions fluctuated and as a response to that water table levels changed over time. Pollen records at Selima Oasis suggest that the latest high stand was

[33] Wasylikowa, Krystyna, "Site E-75-6: Vegetation and subsistence of the Early Neolithic at Nabta Playa, Egypt, reconstructed from charred plant remains." In *Holocene settlement of the Egyptian Sahara*, Springer, Boston, MA, 2001.:584.
[34] Kuper, Rudolph, Kröpelin, Stefan, Climate-controlled Holocene occupation in the Sahara: 805-806.
[35] Hoelzmann, Philipp, et al., Precipitation estimates for the eastern Saharan, 106.
[36] Pachur, et al., Late Quaternary hydrography of the eastern Sahara: 344.; Haynes et al., Holocene palaeoecology of the eastern Sahara: 109.
[37] Pachur, et al., Late Quaternary hydrography of the eastern Sahara: 344; Nicoll, Kathleen, Recent environmental change: 570.
[38] Pachur, et al., Late Quaternary hydrography of the eastern Sahara: 344.

at approx. 9670 to 6840 yr. cal. BP. Freshwater dominates during the first millennium of the lake history, on the other hand from after around 8770 cal. BP. The stratigraphic record at Selima indicates that the lake persisted profound evaporation from approx. 7830 to 6840 cal. BP, ensuing in the formation of a saline lake around the end of the 8th millennium cal. Bp. The sediments also show that the change towards salinity was interrupted by short phases of lower Ion load which means the existence of the lake was because of an aquifer controlled by the local charge and discharge[39].

7. Stone artefacts sample of the site

An example of stone artefacts - was chosen for study- came from excavation pit 3. The stone artefacts material of Burg et Tuyur 80/64-3 consists of 760 artefacts with a total weight of 1.069 kilograms. These pieces were derived from the surface collection (101 pieces) and sediment excavation. These artefacts include flakes, blades, chips, chunks, cores (unretouched blanks) and tools (retouched blanks). The production in Burg et Tuyur 80/64-3 is dominated by chips with a rate of 46% of all the artefacts which is typical for a knapping site. Flakes come in the second rank with 34% then blades consist 11% of the collection. Chunks found in the site are about 7%, while cores represent 2% of the artefacts.

8. Chronological consideration

Based on the artefacts found on the site and the preliminary studies done on the site during the excavation and comparison between other surrounding sites in Egypt and Sudan, the site can be placed in the time frame of middle palaeolithic in the lower layers up to Epipalaeolithic in the upper layers. This means the sites was visited repeatedly during the time mentioned above. By comparing the artefacts from both Gilf Kebir in Egypt, and Wadi Shaw/Wadi Sahal sites in Sudan, it became clear that there were very strong resemblances in artefacts, especially in the ceramic decoration; for example comb-impressed decoration below rims of the Gilf-Type. Also sherds that could be assigned to the Laqiya-Type were found in the excavation, this type of ceramics was very common in Wadi Shaw and dated around 6,000 - 5,000 B.P[40].

[39] Pachur, et al., Late Quaternary hydrography of the eastern Sahara: 344-347; Maxwell, Ted A., and C. Vance Haynes Jr**,** Sand sheet dynamics: 1625-1626.; Nicoll, Kathleen, Recent environmental change: 570.

[40] Schuck, Werner, An archaeological survey of the Selima Sandsheet: 243.

9. Conclusion

The Eastern Sahara - now void of any human presence except for the oasis- had a rich history of human settlements and activities. Thousands of prehistoric sites were discovered by many research projects over the last few decades. B.O.S project (Besiedlungsgeschichte der Ost-Sahara) had a major role in exploring, studying, and publishing some of these sites. Selima Sandsheet was known by the palaeolake that lasted around 6 millennium and also the humid weather during Early Holocene supported living conditions and human settlements around it. Nearly 40 sites were discovered in the vicinity of Burg et Tuyur area by B.O.S researchers. Burg et Tuyur 80/64 was discovered in 1980 but excavated in 1984/1985. The finds varied from lithics, pottery and rock art. The dating of the site can be traced back to Middle palaeolithic as indicated by finding Levallois technique tools in the lower layers to Early Holocene.

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