African Journal of History and Culture Vol. 3(1), pp. 13-19, February 2011
Available online at http://www.academicjournals.org/AJHC
ISSN 2141-6648 ©2011 Academic Journals

Full Length Research Paper

Reconstruction of the palaeoenviroment of Wadi Farja (Nile, Third Cataract) from zooarchaeological remains

Yahia Fadl Tahir

Department of Archaeology, University of Khartoum, Sudan. E-mail: yahiasd@yahoo.com.

Accepted 3 February, 2011

Wadi Farja is a dry Holocene palaeochannel situated in Northern Sudan on the Eastern bank of the Nile, immediately North of the Third Cataract region. The human occupation of the Wadi peaked in the Neolithic (5000 to 3000 BC) through Kerma (2500 to 1500 BC) periods. The Wadi is relatively rich in bioarchaeological materials, such as mammalian bone fragments, fish bones and bivalve shells. It is concluded that the different classes of remains collected are indicative of the extent of animal palaeobiodiversity and the prevalence of savannah conditions at that time. The Wadi Farja was with a permanent water body, as the nearby Fad seasonal stream existing today.

Key words: Palaeochannel, Farja, Fad, Third Cataract, holocene, neolithic, Kerma, bioarchaeological, savannah, hippopotamus, *Coelatura*, *Etheria elliptica, Pila ovate, Lates niloticus*.

INTRODUCTION

Biological evidence in the form of fossil plant and animal remains has always been the cornerstone of the reconstruction of past environments. In the past, Sudan has had a network of water channels (Thurmond et al., 2004; Williams, 2010). Because of climate change and geological processes like erosion and perception, some channels were buried, whilst others changed their courses. Accordingly, there are a large number of palaeochannels known in Sudan. They are rich in archaeological remains, such as those in the western Dongola Reach (Woodward et al., 2001), Holocene palaeochannels Hawawiya, Alfreda Seleim Niles (Welsby, 1995) and the Wadi Howar (Jesse and Keding, 2002). The Mahas survey project reported many archaeologically important palaeochannels in the third cataract region. They exist on both banks of the Nile:

Gaamuffa near Ashaw village, Koka; east of Koka village and Sesiebi-Gorgod, east of the Sesiebi and Gorgod villages

These channels are dated back to Holocene wet period Edwards and Osman (1992, 1994). It is now well known that "khors" (water drainage channels) also contain archaeological sites not only near the Nile but occasionally even deep into the desert. One of the notable ongoing changing processes in the Third Cataract is that is affecting the seasonal tributary stream of Nile called Fad. It is one of the Nile streams and similar to Wadi Farja but is deeper than it, so still water flows only during the flooding season.

The Fad stream flows east of Arduan Island and connects with Wadi Farja at Masida village. After the Nile flood retreats in September to October, the Fad stream becomes a series of lakes. It was noticed in recent years that, the stream is threatened by silt accumulation; leading to the disappearance of several previously existing lakes (De Henizelin, 1968). The Wadi also may have been subjected to such processes during the end of Holocene period times in which the Nile level became low. Wadi Farja is dry now and no human settlement has been reported there since Kerma times (2500 to 1500 BC). Edwards and Osman (1994) recognized that many earlier archaeological sites, including those of Kerma (2500 to 1500 BC) age, may await discovery in areas further away from the river which are now true desert. The Mahas project plans to carry out some limited reconnaissance in the desert hinterland in only two areas:

The bend of the river on the East Bank of the Nile North of Tombos and near Sesiebi-Gorgod villages on the West bank

In 1993, Bonnet and Reinold discovered a number of Kerma-period sites in the desert at a distance of 17 km east of the Nile (Bonnet and Reinold, 1993). This paper

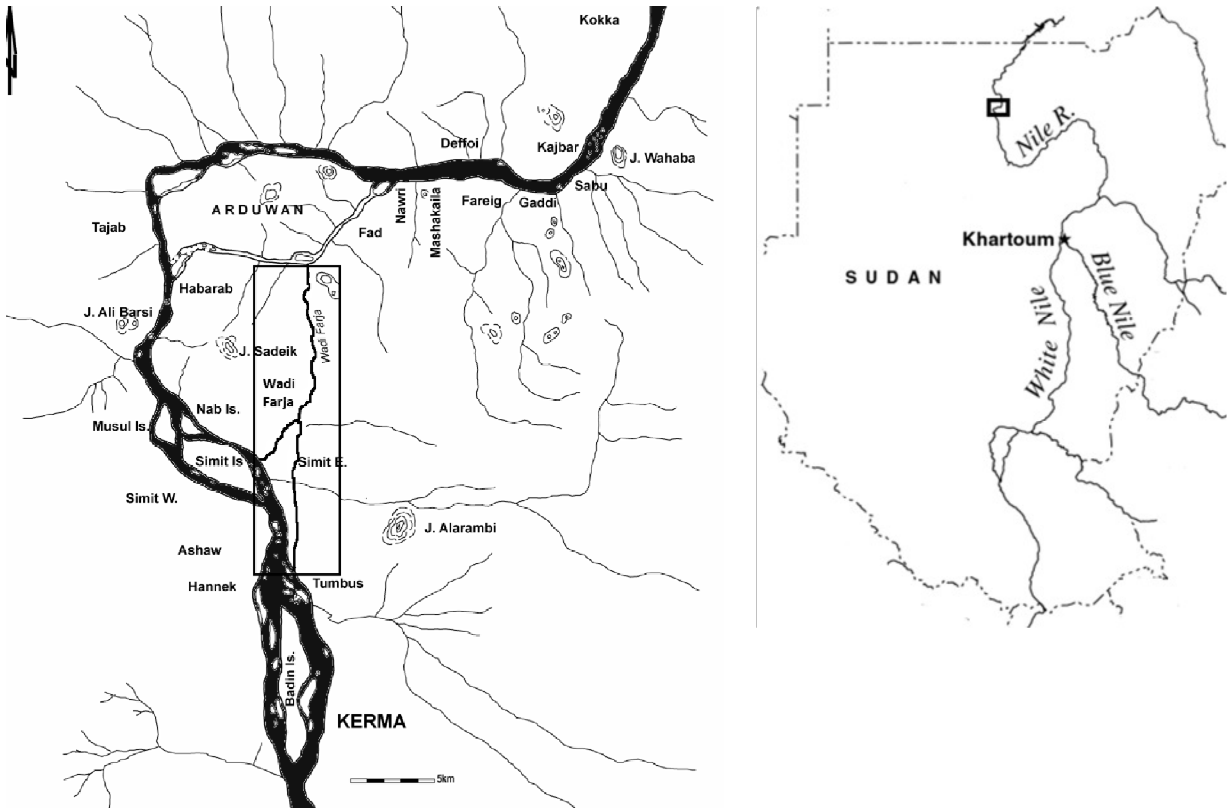


Figure 1. Showing Wadi Farja in third Cataract Region (Sudan).

brings new light to bear on the zooarchaeological remains from Wadi Farja, which is one of the components of the Third Cataract region.

The situation of Wadi Farja

The study area is situated in northern Sudan on the eastern bank of the Nile immediately north of the Third Cataract region. It is considered to be the most important Nile palaeochannel in the area and it is rich in both archaeological and zoological remains. The Wadi includes the main Wadi and many other inlet and outlet drainage channels (khors) to the east and west. The Wadi Farja extends from Simit West village (19°45.517’/30°23.120’) in the south to Masida village in the north (19°53.619’/30°23.402’). Another branch comes from the south from Tombos and Kabodi villages (19°44.434’/30°22.488’) and connects to the main channel east of Simit West (19°47.524’/30°22.465’). Its length is estimated to be 15 km, crossing the rocky desert in a northeasterly direction (Figure 1). Just the north of Kerma town is a sudden change in the scenery as the river crosses onto the crystalline basement complex rocks; the landscape becomes rugged, with numerous small granite gebels (hills). The river itself breaks up into numerous channels passing around islands, which have been counted to be more than 65.

There is an abrupt change from the northerly flow at Arduan Island to an easterly flow. The general geological structure of the area is Nubian sandstone but, here it is cut with dykes and volcanic rocks. The floor of Wadi Farja is covered mostly by sand and alluvial soil. Whiteman (1971: 128) said that the third Cataract may have dammed back the Nile and the Pleistocene sand gravel and silt of the Kerma Basin accumulated due to this damming. Williams et al. (2010) mentioned that the now arid main Nile Valley in northern Sudan was a significant overflow channel from the early Holocene Nile between 9500 and 7500 BP.

Palaeoenvironment and archaeology in the Wadi Farja

The study revealed the human occupation of the Wadi peaked in the Neolithic through Kerma periods. Archaeological sites reported were one Paleolithic, 13 Neolithic (5000 to 3000 BC), 11 Pre-Kerma (3000 to 2500 BC) and 13 Kerma (2500 to 1500 BC), most of them being settlement sites (Figure 2). This coincides with high levels of lake volume and river flow in Africa (Butzer, 1976) at

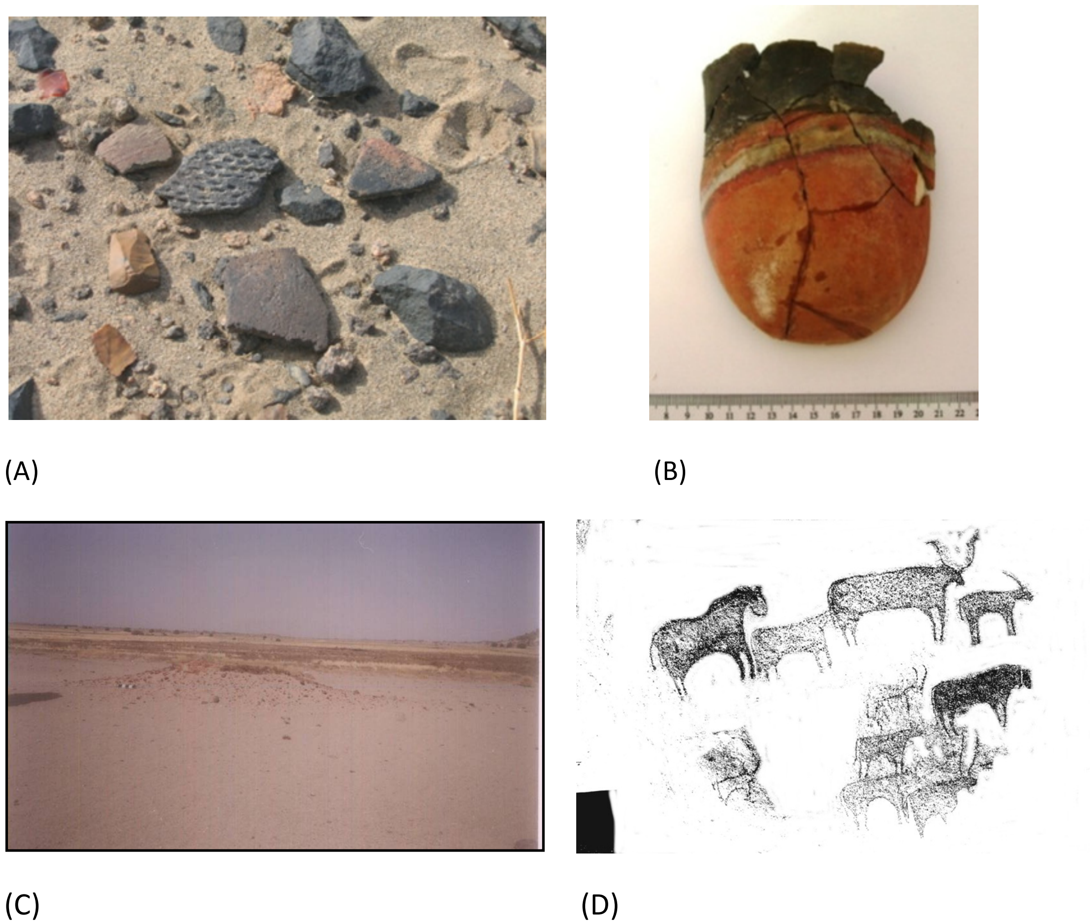


Figure 2. (A): Neolithic pottery shreds (FAR 013), (B): Kerma pottery shreds (FAR 013), (C): Burnt mound (FAR 039) and (D): Animals rock drawing (FAR 05).

a peak around 8000 BP, prior to the aridity during and after the Ice Age. Lake volume was high between 5000 to 3000 BC with two short drought periods around 2150 to 1200 BC (Evans, 1990). Archaeological contexts from the Wadi are relatively rich in bioarchaeological materials (Table 1), such as bone and shell fragments. The second feature is the existence of natural hearths (burnt mounds) (Figure 2). Other very well preserved archaeological sites are the rock drawings and rock gongs in the area and on many neighboring sites (Figure 2). These include human figures, bovines, giraffes, elephants, a leopard, hippopotamus, and antelopes.

Rock drawings reflect the long-lasting interaction between people and their environment in the area.

MATERIALS AND METHODS

Zooarchaeological remains from Wadi Farja were collected during the walking survey (March 2004, June 2005 and June 2006). Most of the archaeological materials were collected at a surface level. But, three test pits were dug in the mouth, in the middle and at northern end of the Wadi. For more convenes also, one of the pits was in the belly of the Wadi and one on the edge of the bank (FAR 011) as the third was on the top of the bank and some biological materials were obtained from this site. These were bivalve shells. The test-pits dug in FAR 04, some artifacts were found. These were Kerma shreds and some undiagnosed carbonized materials (Figure 3). The samples were kept in labeled plastic bags or containers and sent to the laboratory for identification, classification and measurement. Mammalian bone fragments, fish bones and bivalve shells were identified at the University of Khartoum, Department of Anatomy (Faculty of Veterinary Medicine) and the Department of Zoology (Faculty of Science). The fish vertebra was used by Chogunova (1959) in aging fish. According to Bagenal and Tesh (1978) body growth and aging structure are proportional one to another. Unit vertebrae was cleaned and examined under a binocular microscope to count annual rings. The size and weight of the fish were obtained using the back calculation method from previously known equations (Chogunova, 1959).

The zooarchaeological remains

Aquatic zooarchaeological remains such the Bivalve identified as *Coelatura* sp. (Family Unionidae), are very common in Wadi Farja (for example FAR 010-19°49.676/30°23.608) (Figure 4A). Large numbers of growth increments of the shell were noticed, but the aging is difficult because no adequately documented age assessments have been made before for in Sudan. Jones (1989)

Table 1. The archaeological feature of sites in Wadi Farja.

Site	Site date and type	Coordinate	Main archaeological feature
FAR010	Neolithic occupation	19°49.676 /30°23.608	Bone and shell fragments
FAR051	Pre-Kerma occupation	19°47.302 /30°21.940	
FAR058	Undated occupation	19°47.262 /30°21.815	
FAR060	Kerma occupation and graves	19°49.016 /30°22.790	
FAR023	Early Kerma? occupation	19°49.453 /30°23.221	
FAR024	Pre-Kerma? occupation	19°49.499 /30°23.423	
FAR010	Neolithic occupation	19°49.676 /30°23.608	Hearths (burnt mounds)
FAR023	Early Kerma? occupation	19°49.453/30°23.221	
FAR024	Pre-Kerma? occupation	19°49.499 /30°23.423	
FAR039	Burnt mounds	19°51.082 /30°23.933	
FAR005	Rock drawing	19°52.692 /30°23.655	Rock drawings
FAR014	Rock drawing	19°52.523 /30°23.489	
FAR041	Rock drawings and walls	19°51.529 /30°23.614	
FAR044	Rock drawings	19°48.499 /30°22.376	

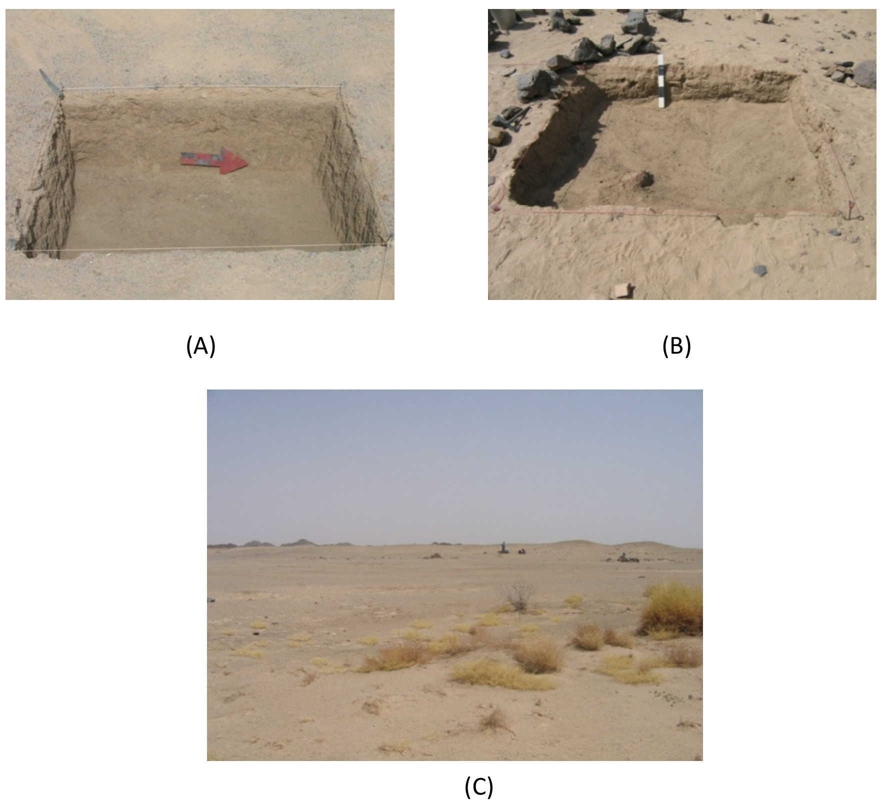
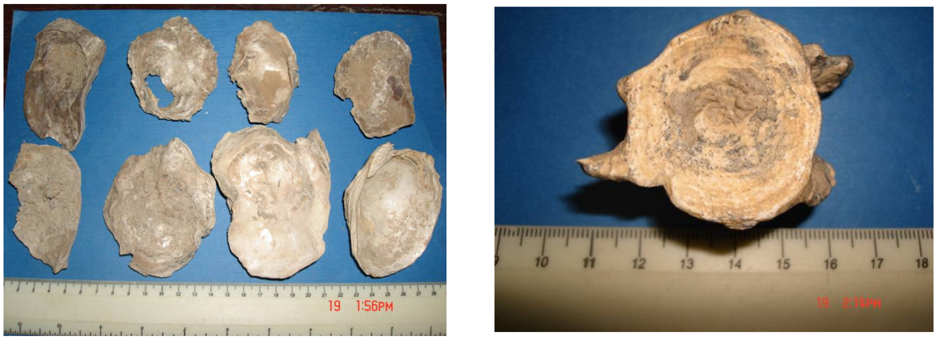


Figure 3. (A): Test-pit, Location: (19°47.282/30°21.889), (B): Test-pit, FAR 4, and (C): A general view and test- Pit, FAR 11.

commented on the growth structures of bivalves; the internal shell growth patterns are best viewed in cross-section and the technique is applied to bivalve shells, which possess annual patterns of growth increments, typically recognizable as large white bands alternating with thinner dark bands. Because of this potential variability in timing and cause of ring formation, the periodicity of supposed yearly increments in a given bivalve species is variable. Aging study of bivalves has become very important in palaeo-environmental studies because they have a long lifespan and these which ranges in the size of rings are thought to reflect periodicities



(A) (B)

Figure 4. (A): Coelatura sp. (FAR010) and (B): Nile perch vertebra (different sites) (FAR 010-19°49.676/30°23.608)

such as daily light-dark cycles, and annual (seasonal) temperature cycles (Jones, 1989: 2 to 13).

The Nile oyster *Etheria elliptica* (Family: Etheriidae) was very common in the Wadi Farja (Figure 4A). Its relatively thick shell indicates the well-oxygenated and hence flowing water of Wadi Farja in the past. *E. elliptica* mainly inhabits the Nile cataracts (Rodrinues et al., 2000). It is usually attached to rocks by one valve. Two samples of the Nile oyster from site FAR 039 were dated in the Dating Laboratory, University of Waikato Radiocarbon, New Zealand. The results obtained were 7617 ± 50 BP and 7678 ± 50 BP, that is, mid- Holocene. Rodrinues et al. (2000: 181 to 187) showed the seasonality of Wadi Howar, an annual pattern of two rainy seasons by using shell isotope data technique. *E. elliptica* is usually found at 10 m below the surface of the water in large rivers and lakes. When the levels of the water are low, the uppermost shell becomes exposed. In strongly moving water they attached themselves to rocks and also to other shells of their kind (Pilsbry and Bequaetert, 1927:453). Samples of *Pila ovata* (Family: Piliadae) species were collected from site (FAR 010-19°49.676/30°23.608). Nile oyster lives in Nile valley on mud banks feeding on aquatic plants and phytoplankton (Malek and Cheng, 1974: 66, 69). The large numbers of growth rings noted in bivalves indicated the long lifespan of the bivalve and, consequently, the persistence of a water body. The presence of *P. ovata* has ecological implications, demonstrating the existence of muddy shores. Fish vertebrae were collected from three sites (FAR 010, FAR 060 and FAR 065) and classified as Nile perch (*Lates niloticus*; Family: Centropomidae) (Figure 4B).

It is widespread throughout much of the Afrotropic ecozone, being native to Lake Chad and Lake Turkana, and to the Congo, Nile, Senegal, Volta, and other river basins. It also occurs in the brackish waters of Lake Maryut in Egypt. One of the largest freshwater fish, it reaches a maximum length of nearly 2 m, weighing up to 200 kg. An adult Nile perch occupies all habitats, but it prefers deep water (10 to 20 m) with sufficient oxygen concentration. As a fierce predator that dominates its surroundings, the Nile perch feeds on fish, crustaceans, and insects; the juveniles also feed on zooplankton. The species is of great commercial importance as a food fish (Abdelrahman, 1989). Two broken *Hippopotamus amphibius* radius bones and other fragments were collected from site FAR 053 (Figure 5). The animal is a large, plant eating African mammal, belonging to the Hippopotamidae family. Its lifespan is commonly 40 to 50 years and it reaches sexual maturity at 5 to 6 years. It is an average of 3.5 m long, 1.50 m tall and weighs 1100 to 2600 kg (Dorst and Dandelot, 1970).

Hippopotamuses spend most of the day with the majority of their body submerged in water to stay cool. They consume as much as 50 kg of vegetation per day. Their closest living relatives are cetaceans: whales, porpoises and the like (Saikawa et al., 2004). Before the last Ice Age, the hippo was widespread in North Africa and Europe. They are now distributed in rivers and lakes surrounded by grasslands throughout sub-Saharan Africa. It is now extinct in Egypt and northern Sudan, where it was a familiar animal of the Nile into historic times. The last time the hippopotamus was seen in the Mahas area was in 1812 (Burckhardt, 1919) but it is still found in the Nile river south of Kosti town. *H. amphibius* is a highly territorial animal; and usually found in shallow water, and rarely comes out of that depth. Cattle bone fragments are common remains in Wadi Farja and were collected from different settlement sites and localities. Large unidentified mammal bone fragments (including canine teeth were collected from the sites FAR 053 19°47.302/30°21.940, and FAR060 19°49.016/30°22.790, as examples (Figures 5B, C). Ostrich (Class: Aves) egg shell fragments (FAR 051 19°47.148 /30°22.112) (Figure 5). Unidentified fossil horn and 2 pieces of tortoise dorsal carapace (Class: Reptilia) were collected from location 19°49.300 /30°23.042.

DISCUSSION

The Holocene started approximately at 12,000 BP, with a warm period of 11,000 to 7,000 BP (Noorwdijk, 1984) in Sudan. It coincided with the date of high levels of river flow in Africa (Street et al., 1979: 83 to 118). De Henizelin (1968: 47 to 48) mentioned that the level of the Nile rose to a maximum of 13 m above the modern floodplain during Holocene at Arkin (Wadi Halfa). The date of the *E. elliptica* from Wadi Farja indicated the presence of a body of water in mid Holocene. Whiteman (1971) commented on silt precipitation beyond the Third Cataract damming the river in the Pleistocene. It is thought that the Third Cataract damming and raising the water level had led to an overflow of water into Wadis present south of the dam during the Holocene; so, the most important one being Wadi Farja. Human existence dates back before the Neolithic, but the maximum habitation was during Neolithic and Kerma. The surface material collected from the Neolithic sites included fish remains and bivalve

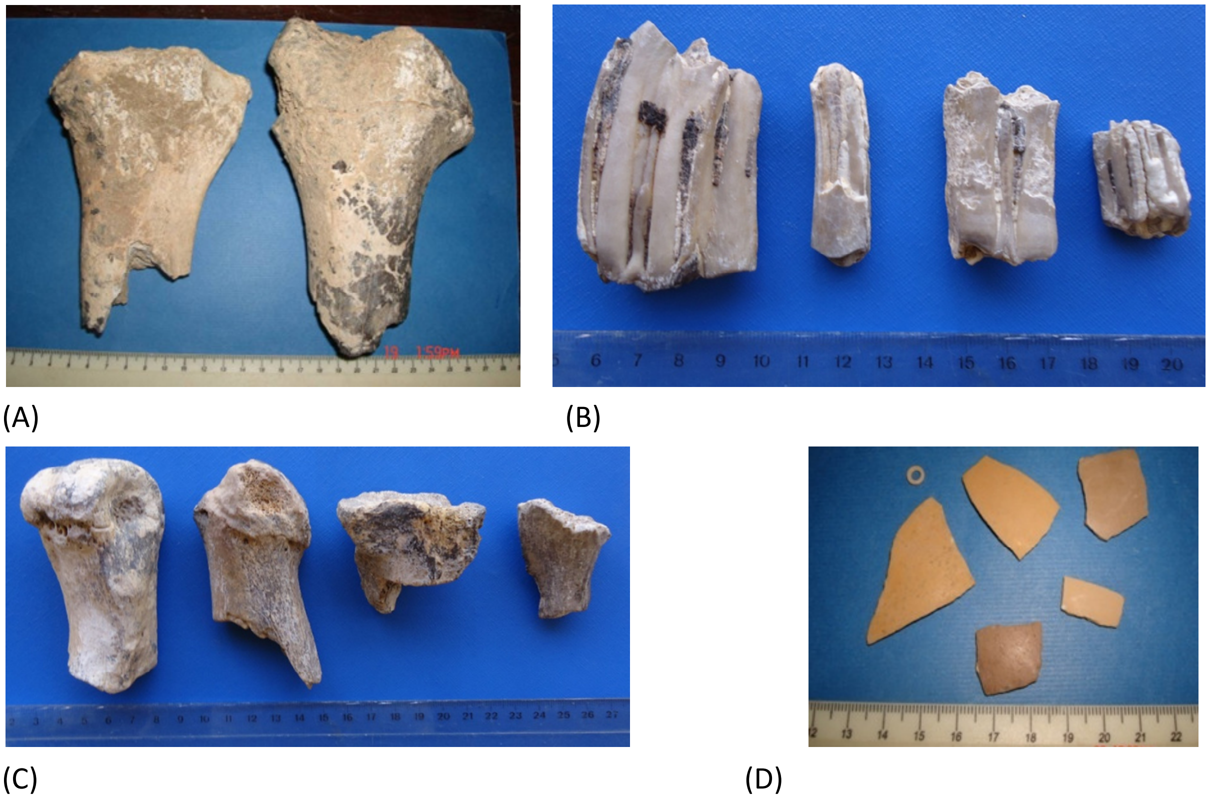


Figure 5. (A): Hippopotamus bones (Near FAR051, location 19°47.285 /30°21.822), (B): Teeth (FAR051 19°47.302 /30°21.940), (C): Radius fragments (Different location) and (D): Ostrich eggshells (FAR05819°47.262 /30°21.815).

shells. Most of sites are located on the edge of the channel banks. These two features imply that the Neolithic people depended on water resources such as fish and mollusks for subsistence at least seasonally. The large numbers of growth increments noted in the bivalves indicate their long lifespan and, consequently, the persistence of a water body, as the rings reflect seasonality of the past climate there.

The presence of Pila has ecological implications, namely the existence of muddy shores and the water receding within the palaeochannel. Many scholars, for example Arkell (1953) identified such animals in central Sudan. The age count of *L. niloticus* vertebrae specimens was in the range of 4 to 8 years. According to Abdelrahaman (1989) back calculation equation, an eight-year old fish would attain with a length of 80 cm in Wadi Farja at that time, which suggests that the palaeochannel's water was oxygenated, that is running and perennial deep and rich in biota. Accordingly, it is suggested that it was a running stream in the past. The presence of such main Nile species, strongly suggests the connection of the channel with the river. Hippopotamus is a highly territorial animal, thus indicating that the bone remains are indigenous to the Wadi. The presence of hippopotamus remains indicates shallow waters and sandy banks. The most distinct implication of these remains is the existence of rich vegetation grassland on which this large animal fed. Because of the complex topography and branching of the Wadi, it is suggested that there were many lakes or swamps, which may have been also fed by local rainfall. Many researchers have found the remains of this animal in Sudan. Thus, for instance, Chaix and Grant found within the faunal assemblage, at Kerma, bones from some of the large African mammals, creatures of the grassy or wooded savannas. These include giraffe, black rhinoceros and hippopotamus (Chaix and Grant, 1993: 399 to 405).

In 1990, Hakim and Bonnet wrote that cattle amounted to 34% of the animals reared at Kerma and played a very important role in the economy. Chaix (1982, 1984) commented that the cattle of Kerma would be situated in the shrubby savanna zone, with more plentiful food resources, which would support the larger African fauna as well as significant herds of cattle, of sheep and goats (Chaix, 1982, 1984). The presence of large number of cattle in the area is confirmed by an Egyptian text of 2,720 B.C., which says that Pharaoh Snefrou brought more than 20,000 cattle back from Nubia. Survey work in the Eastern desert has also shown that settlements existed close to the courses of now dried rivers, and suggest that the cultivation of much more extensive areas of land was once possible (Chaix and Grant, 1993: 399 to 405).

Conclusion

The different classes of remains collected are indicative of the extent of animal biodiversity and the prevalence of savannah conditions at that time. The Wadi was with a permanent water body, as the nearby Fad seasonal stream existing today.

REFERENCES

Abdelrahman A (1989). On Some Environmental and Physiological Factors Affecting Growth and Development of Some Variable Nile Fishes, Ph.D. Thesis. University of Khartoum.

Arkell AJ (1953). Shaheinab, Oxford University Press.

Bagenal TB, Tesh FW (1978). Age and growth: Methods of Assessment of Fish Production in Freshwaters. Ed. T.B. Bagenal. Oxford. Blackwell Scientific Publications, pp. 101- 36.

Bonnet CH, Reinold J (1993). Deux rapports de prospection dans le desert oriental. Geneva XLI: 19-26.

Burckhardt JL (1819). Travels in Nubia. John Murray. Albemarle Street. London.

Butzer WK (1971). Environmental Archaeology An Ecology Approach to Prehistory. (Second Edition). Aldine. Atherton. Chicago and New York.

Chaix L (1982). Troisiéme note sur la fauna de Kerma (Soudan) Campagnes 1981 –1982. Extrait de Genava, 30: 66-70.

Chaix L (1984). Troisiéme note sur la fauna de Kerma (Soudan) Campagne 1983 –1984. Extrait de Genava, 32: 30-34.

Chaix L, Grant A (1993). Palaeoenvironment and economy at Kerma, Northern Sudan, during the third millennium B.C: Archaeological and botanical evidence. Eds. Krzyz˙aniak L, Kobusiewicz M, Alexander J. Environmental Change and Human Culture in the Nile Basin and Northern Africa until 2nd Millennium B.C. [Studies in African Archaeology 4]., Poznan´. Poznan´ Archaeological Museum, pp. 399-404.

Chogunova NI (1959). Handbook on Determination of Age and Growth of Fishes. USSR Academy of Sciences Press.

De Henizelin J (1968). Geological History of the Nile Valley in Nubia. Ed. Fred Wendorf. Vol.1.Dallas: Fort Burgwin Research Center and Southern Methodist Univ. Press, pp. 47-48.

Dorst J, Dandelot P (1970). A Field Guide to the Larger Mammals of Africa. Collins. London.

Edwards DN, Osman A (1992). The Mahas Survey. 1991. Interim Report and Site Inventory. Report No. 2. University of Cambridge.

Edwards DN , Osman A (1994). The Mahas Survey 1990. Report No. 2 (Interim Report & Site Inventory). University of Cambridge.

Evans TE (1990). The History of Nile Flows. The Nile resource evolution, resource management, hydropolitics and legal issues. Eds. Howell P, Allan JA. Conference held in London at the Royal Geographical Society and the School of the Oriental and African Studies. University of London. 2-3 May.

Hakim AA, Bonnet C (1990). Kerma, the Kindom of Nubia. African Heritage since Pharos Times (in Arabic).

Jesse F, Keding B (2002). Death in the desert. Burials in the Wadi Howar region (Eastern Sahara): Eds Jennerstrasse, Tides of the Desert. Gezeiten der Wu¨ste. Contributions to the Archaeology and Environmental History of Africa in Honour of Rudolph Kuper. Africa Praehistorica, 14 p.

Jones DS (1989). March growth rings and longevity in bivalves. Am. Conchol. 17(1): 12-13, 277-293.

Malek EA, Cheng TC (1974). Medical and Economic Malacology. Academic Press. New York–London.

Noorwdijk M (1984). Ecology Textbook for the Sudan. Khartoum University Press.

Pilsbry HA, Bequaetert J (1927). The aquatic mollusks of the Belgian Congo with geographical and account of Congo malacology.

Scientific results of the American Museum of Natural History of Congo Expidition. Gen. Invertebrate Zool., 10: 69-659.

Rodrinues D Abell P, Kropelin S (2000). Seasonality in the early Holocene climate of Northwest Sudan interpretation of Etheria Elliptica shell isotope data. Global and Planet Change. www.elseveer.com/locate/glopacha, 26(2000): 181-187.

Saikawa Y, Hashimoto K, Nakata M, Yoshihara M, Nagai K, Ida M and Komiya T (2004). Pigment chemistry: the red sweat of the hippopotamus. Nature, 429(6990): 363.

Street AF, Grove AT (1979). Global Maps of Lake Levels Fluctuations Since 3000 yr BP. Quaternary Res., 12: 83-118.

Thurmond AK, Stern RJ, Abdelsalam MG, Nielsen KC, Abdeen MM, Hinz E (2004). References and further reading may be available for this article. To view references and further reading you must purchase this article.

Welsby DA (1995). The North Reach Survey. The 1994 season. a: Survey. SARSN, 8: 2-7.

Whiteman AJ (1971). The Geology of the Sudan Republic. Clarendon Press Oxford.

Williams MAJ, Williams FMA, Duller GAT, Munro RN, El Tom OAM, Barrows TT, Macklin M, Woodwards J, Talbot MR, Haberlah D , Fluin J (2010). Late Quaternary floods and droughts in Nile valley Sudan: new evidence from optically stimulated luminescence and AMS radiocarbon dating. Quaternary Sci. Rev., 29(2010): 1116-1137.

Woodward JC, Macklin MG, Welsby DA, Beatman MD (2001). Holocene river dynamics in the Saharan Nile: Geochronology and geoarchaeology on the PEP III transect in the Dongola Reach. Northern Sudan. PEPIII: Past Climate Variability Through Europe and Africa. 27th to 31st August, Centre des Congrès. Aix-en-Provence. France. http://atlas-conferences.com/cgi-bin/abstract/cahi-61.