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Palaeoenvironment and economy at Kerma, Northern Sudan, during the third millennium B.C.: archaeozoological and botanical evidence

Kerma is situated in the north of Sudan, approximately 20 km south of the third cataract, on the right bank of the Nile (Fig. 1). Around 2,500 B.C. a unique culture developed in that region, for which Kerma seems to be the major site. It is placed at the crossroads of the main north-south route down the Nile Valley and the east-west desert route. It is very likely that the town was the capital of the powerful kingdom of Kush, a constant thorn in the flesh of the Egyptians (Bonnet 1984; Bonnet 1986). The origin of the Kerma civilization are to be found in the Sudanese and Egyptian Neolithic, whence various aspects of the funerary ritual can be traced. The most ancient settlement, named the pre-Kerma, has recently been discovered within the Kerma necropolis, and demonstrates this continuity (Bonnet 1986).

Excavations have been carried out in two main areas, at the ancient town, sited approximately 1.5 km from the Nile, and the necropolis, approximately 6 km to the east of the Nile (Fig. 2). In the centre of the town was a massive building of mud brick, known as a Deffufa. It was used as a temple, and investigations of this structure have revealed a complex history of building and modifications (Bonnet 1981). There are preserved remains of a large number of other structures, including defensive walls, further cult buildings, houses, workshops and bakeries, built with a range of ovens, clearly designed for the production of large quantities of bread (Bonnet 1988). The necropolis, which also contained a Deffufa, covers a large area of several kilometers, with the number of graves estimated at over 20,000. There seems to have been a chronological development in the use of the area and in its burial traditions from the north to south. The beginnings of the Kerma culture were around 2,500 B.C., thus contemporary

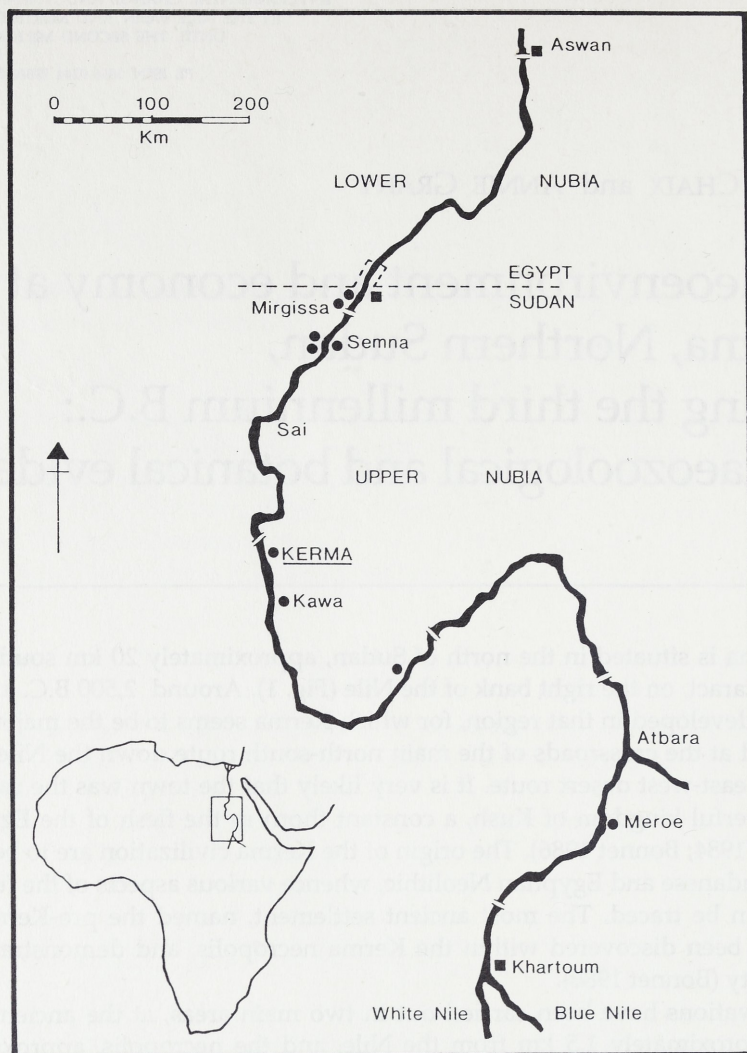


Fig. 1. Map showing the location of Kerma.

with the Old Empire in Egypt. It flourished for approximately a millennium, with its fall, around 1,500 B.C., after the conquest of the region by the armies of Thoutmosis I (Bonnet 1981). Our research has mainly involved the study of the animal and plant remains recovered from the two main areas of the site, and concerns both the environment and the economy of the settlement.

The environmental indicators present a somewhat conflicting picture. Kerma now lies within a desert zone, characterized by a rainfall of less than 50 mm of water per year, with vegetation confined to the banks of the Nile and the large

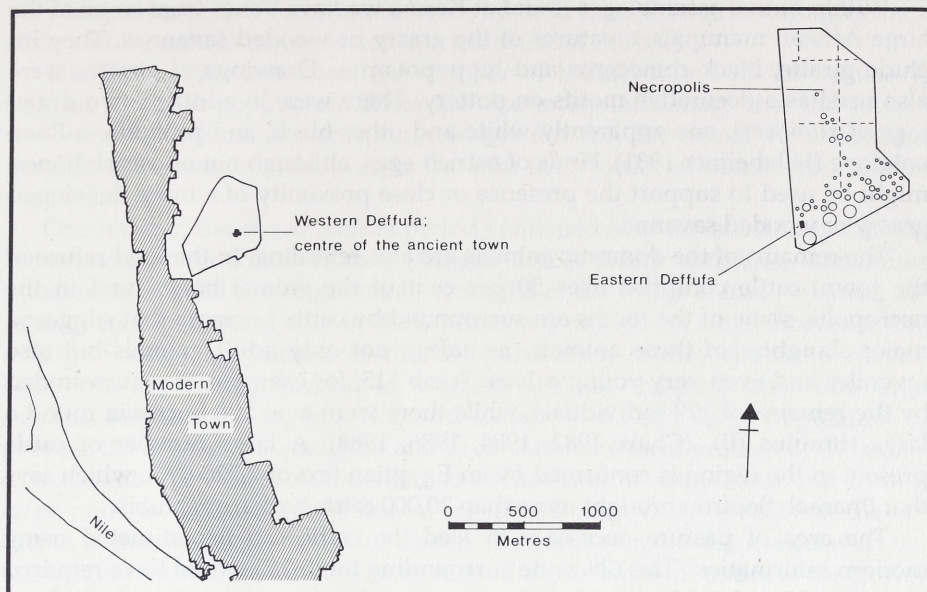


Fig. 2. Sketch map showing the location of the ancient town and the necropolis at Kerma.

wadis. The Nile acts as a permanent reservoir of water, with its banks forming a continuous oasis through the heart of the desert.

Supporting a view that the environment at the time of the occupation of the ancient town of Kerma was similar to that of the present day we have two main lines of evidence. Firstly there is the exceptional state of preservation of the organic remains in the tombs. Feathers, skin and hair, cloth and leather are frequently very well preserved. Often the skin, hair and even the guts of both the human burials, and of the sacrificial sheep found in the tombs have been naturally mummified by desiccation. It seems unlikely that these remains were ever exposed to moisture. We can in addition point to the good state of preservation of the mud brick Deffufas and the foundation of the houses in the town, which show little sign of erosion.

Attempts to recover preserved pollen grains were initially unsuccessful, but recent analysis carried out by David Taylor has demonstrated that they are sometimes preserved, if fairly poorly, in sheep and goat coprolites. The species so far identified all suggest flora very similar to that of the present day. We have pollen from several types of acacia, jujube and various *Urticaceae*, *Graminae* and *Cyperaceae*. Preserved macroscopic plant remains, such as the casia seeds found in the sheep's stomachs, together with the wood charcoal also confirm this impression of an arid environment (Taylor, unpublished). We have, however, several lines of evidence to suggest more moist environment than at present.

Within faunal assemblages found at Kerma we have bones from some of the large African mammals, creatures of the grassy or wooded savannas. They include giraffe, black rhinoceros and hippopotamus. Drawings of giraffes were also used as a decorative motifs on pottery. There were in addition two drawings of rhinoceri, one apparently white and other black, and probably a Roan antelope (Hilzheimer 1931). Finds of ostrich eggs, although not of ostrich bones, might be used to support the presence or close proximity of a more developed grassy or wooded savanna.

The remains of the domestic animals are also revealing. In the food refuse of the town, cattle comprise over 50 per cent of the animal bones, and in the necropolis, some of the tombs are surrounded by cattle bucrania that suggest a major slaughter of these animals, including not only adult animals but also juveniles and even very young calves. Tomb 115, for example, was surrounded by the remains of 129 individuals, while there were over 500 bucrania round a large tumulus (B), (Chaix 1982; 1984; 1986; 1988). A large number of cattle present in the region 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.

The area of pasture necessary to feed the cattle can be estimated using modern information. The 129 cattle surrounding tomb 115 would have required between 100 and 200 hectares, while those round the large tumulus would have required between 400 and 800 hectares. Comparison with the present situation in Nubia is telling. Cattle now form less than 5 per cent of the domestic animals, while sheep and goats account for nearly 90 percent. Palaeobotanical work carried out at several sites in the desert of the Northern Province has suggested that the limit of the true desert during the third millennium B.C. was 400 km further to the north than at present (Jackson 1957; Wickens 1975; Mawson and Williams 1984; Ritchie and Haynes 1987). Kerma would thus 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 and of sheep and goats. Survey work in the eastern desert has also shown that settlements existed close to the courses of now dry rivers, and suggest that the cultivation of much more extensive areas of land was once possible. The presentation of the evidence must, in the context of this very brief paper, be rather simplistic. We clearly have a set of rather contradictory information but its interpretation depends not only on our views of the natural environment, but also on the nature of the economic, political and cultural situation at the town of Kerma. In relation to the environment, we should not forget the role of the Nile itself. The volume of water brought down during the annual Nile flood may well have been far greater than at present, allowing much larger areas of land to be cultivated and providing the moisture to support much more extensive areas of pasture for the feeding of the domestic flocks. Irrigation would be an obvious way of further exploiting the Nile waters, but no traces of any irrigation systems have yet been found.

A well developed agriculture, probably capable of producing a surplus beyond the subsistence needs of the population is suggested by the cereal remains found in the tombs, the bakeries with their batteries of ovens, and the

very large numbers of bread moulds, found at Kerma, as at other contemporary sites, and thought to be connected to a ritual use of the bread.

The size of the town, and the number of burials found in the cemetery, suggest a sizable population. There are also many indications that the society was very hierarchical. In particular, we have not only the size of the tombs and the richness of some of the burials, but also the practice of human and animal sacrifice.

One tomb of the classic Kerma period contained over 600 subsidiary burials, interpreted as sacrificial victims (Reisner 1923). Sheep sacrifices, sometimes numbering over 20 in a single tomb, consisted of the whole animal, whereas the cattle were represented only by their horns and part of the skull. However, the killing of such large number of animals, particularly as they appear to include both breeding females and calves, suggests not only the production of a large surplus, but also the organization and social control of a large population to provide the animals for slaughter and to consume the meat produced. Of course it is possible that the cattle bucrania came not from a single herd, but from a large number of small herds, drawn together from a wide territory at the occasion of the death of a powerful leader. The cattle remains associated with the tombs may thus be as much an indication of the extent and nature of the power of some members of the Kerma population as of the numbers of animal kept in the immediate environment (Chaix and Grant 1992). However, the high percentage of cattle bones found in the ordinary domestic refuse of the town, does support the importance of local cattle keeping. It is difficult to imagine that in the unstable political climate of the Nile Valley in this period, Kerma could have maintained its position of importance if it did not have sufficient local resources to maintain its population, without a heavy dependence on trade or tribute for the essentials of life. However, in this context we must also consider the possibility that some of the more exotic faunal remains, perhaps at least the ostrich shell, may have been a trade item rather than a local resource.

The husbandry of sheep and goats, perhaps the most suitable animals for the local environment, was one with the clear aim of producing food, and in particular meat, with milk and skin products of lesser importance. In this respect, it is remarkable similar to that of the present day. The present environment supports fairly large numbers of sheep, which while providing a relatively small part of the total food consumed, are very important for the meals marking special events. At ancient Kerma the sheep, like the cattle seem also to have had a symbolic importance. In several of the tombs, some of the sacrificed lambs, carry circular ostrich feather headresses attached by leather thongs to between their horns, and bead pendants hanging from the tips of the horns (Chaix and Grant 1987; Bonnet 1984; Chaix 1987).

It is clear that at this site, assessment of the role of domestic animals is complicated by our difficulty in separating their economic from their ritual and symbolic value. The work completed so far on the animal and plant remains from the site of Kerma has provided a tantalizing and often contradictory glimpse of the environment, economy and social complexity of this important site. We have

the very good fortune to have remarkably well preserved animal remains from the cemetery, but the misfortune to have only very poorly preserved pollen with which to allow us to reconstruct the vegetation of the site. Continuing seasons of excavations are planned, and may produce further evidence to help us to resolve some of the issues raised in this paper.

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