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## Climatic and cultural changes in the Southern Atbai, Sudan, from the fifth through the third millennium B.C.

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The relationship between regional climatic shifts and culture change has a powerful appeal to those archaeologists working in the climatically marginal zones of the world. Both theoretically and practically, there are expected covariations between increasing and decreasing precipitation and/or temperature and shifts in human adaptation, as reflected in patterns of economic exploitation, site locations, and even material culture inventories. Having recognized the truth of this general proposition, however, does not make a positive correlation between regional climate change and culture change explanatory, even under the most extreme conditions. Obviously, the shift from hyper-arid to pluvial conditions in the Southern Shara is powerfully correlated with man's entry into the region, although, as it must be admitted, the new potential for human exploitation there does not explain why man chose to do so, except on the most general principals.

In situations where climatic change is not so extreme, where man's presence is more or less continuous before, during and after the change, much care must be taken to avoid using regional climatic change as form of simple-minded environmental determinism. This is particularly true when one onset of regional climatic change seems to be positively correlated with apparent culture change. Such a situation exists in the Southern Atbai in the far eastern Sahel at the onset of the Mid-Holocene dry phase at about 5,000 B.P. (Wickens 1982) and, while regional climatic change undoubtedly play some role, local environmental variations well may have been more important than regional ones (Marks and Sadr 1988).

To examine this, it is first necessary to take a brief look at the Southern Atbai and its Early and Mid-Holocene prehistory. The Southern Atbai is located between the Atbara River and the Eritrean Hills of northern Ethiopia. It is the



southern extension of the flatlands which lie to the west of the Red Sea Hills in northeastern Sudan, as well as being an eastern extension of the huge Butana grasslands which lie to the west of the Atbara River Valley. Unlike the Butana, however, which has some topographic relief and patches of fairly rich vegetation, the Southern Atbai (and particularly its western half) is almost devoid of significant topographic features and its heaviest vegetation consists of rather thick stands of thorn trees. Since it today receives over 300 mm of rain per year, it is likely that the presently barren landscape is in large part due to overgrazing and extensive deforestation for charcoal production. The same situation prevails along the Atbara River, only there is greater topographic relief because of very active erosion all along the eastern edge of the Atbai steppe. Between the steppe and the river itself is a highly eroded "badlands" where thorn trees prevail and the whole area is heavily grazed by domestic stock.

None of this area seems particularly inviting to man, although it is today used extensively after the summer rains. Yet, the area was rather different during the Early Holocene and well into the Mid-Holocene, based on faunal, floral and other evidence. In fact, during the Early Holocene the area is postulated (Wickens 1982) to have been covered with a deciduous savannah woodland, comparable to that found today some 175 km south of Kassala, its major town, and to have had a high level of rainfall in the catchment areas of its rivers (Adamson 1982).

During the Mid-Holocene, beginning at about 5,000 B.P., there was apparently little change in vegetational patterns, in spite of a drop in precipitation. It was only at about 3,000 B.P., according to Wickens (1982), that the present vegetational patterns, in climax form, appeared. In this context, it is possible to correlate major culture change with the onset of the Mid-Holocene dry phase, while at the same time recognizing that there was little vegetational change and, probably little change in megafaunal populations.

Overall, therefore, the pattern of climatic change in the Southern Atbai from the Early Holocene through the Mid-Holocene was one of gradual drying, with the onset of the Mid-Holocene dry phase seen essentially, at first, in a slow drop in precipitation. Thus, the Holocene climatic history of the Southern Atbai during this period provides only the most general of backdrops onto which the changing patterns of human settlement and adaptation may be projected. These regional climatic patterns, by their very nature, do not reflect accurately the variations in local conditions and their fluctuations through the time which, in one case, at least, appears to have had major impact on culture change.

In order to understand the Southern Atbai during the Holocene, one must realize that the major portion of its moisture comes from rivers, the waters of which originate well south of the central Sudanese climatic zone. The largest river is the Atbara but its deep incision into the landscape limits its effective water to its edges. The Gash River, on the other hand, which derives its highly seasonal flow from some 21,000 sq. km of Ethiopian hill slopes, has a very shallow bed which virtually guarantees wide scale surface inundation, as well as deposition of permeable sands over the local impermeable clays (Whiteman 1971).



The geomorphic history of the Southern Atbai has been dominated by the northeasterly shift of the Gash River to its present position along the hills of Eritrea. It appears from both archaeological and geomorphic studies that during the Early Holocene the Gash flowed into the Atbara River somewhat north of the town of Khashm el Girba. Because of its shallow bed and seasonally variable flow, its course tended to be braided and meandering and, through time, began to move away from the Atbara. Undoubtedly, part of the reason for this was the decreasing volume of flow brought about by lower rain levels in its catchment area as the Early Holocene waned. This probably accelerated during the early Mid-Holocene. However, as the Gash moved, the area of seasonal inundation moved with it and, as its delta moved to the northeast, the amount of local inundation to the west of the Gash depended upon the degree of local soil permeability, the amount of overbank flooding, and distance from the Gash channels. While the amount of overbank flooding is directly related to regional climatic conditions, the other factors are strictly local, and it is them which had direct local effects, at least, during the 3rd millennium B.C.

These effects can be seen most clearly in settlement pattern data, combined with information on diachronic economic adaptations. While this paper will focus only on the Early and Mid-Holocene, information is readily available for later periods (Sadr 1988).

Culturally, the Early Holocene is represented by a small number of sites located in the Atbara River Valley. At first, they were pre-ceramic and quite distinct from other pre-ceramic manifestations further north (Marks, Peters and van Neer 1987). Their economy was based on hunting and fishing, with a few sickle blades in the later sites, suggesting some plant processing.

By 6,200 B.P., there were ceramic producing peoples in the area, again apparently with their habitation sites limited to the Atbara River Valley (Marks 1987). These folk, too, were hunters and fishermen. They exploited both the riverine environments and the steppe edge, as seen by the diversity of megafauna hunted which included a good range of small to large antelopes (Peters 1986a). Their sites, less than one third of a hectare, contain minimally shaped grinding stones but no sickles. Their ceramics are abundant and well made. The pots have simple conical bottoms and banded zones of impressed decorations around their upper halves. The variety of impressed techniques, mainly comb impressed rocker-stamping, parallels that seen during the Khar-toum Mesolithic in the central Nile Valley. The only exception is a series of pots with zoned bands of small knobs. These have the same position on the pots as do the more typical decorations but their technique of manufacture – pushing the clay out from the inside wall with the thick stick, filling the indentation with a small rock and then covering it with a bit of clay – is unknown in the central Nile Valley during both the Mesolithic and the Neolithic (Arkell 1949; 1953; Nordstrom 1972; Caneva 1988; Chłodnicki 1982).

The stone tools associated with this ceramic assemblage are uninspired, although there are a few elongated lunates, which are quite distinct in form from those lunates associated with the late pre-ceramic period. The marked differen-



ces between the lithic assemblages of the late pre-ceramic assemblages and those of these early ceramic-bearing ones suggest that there was no developmental continuity between the two and, therefore, that these early ceramic sites represent newcomers into this area of the Atbara River Valley, although not from the central Nile Valley (Marks 1987).

Around 5,600 B.P. there was a marked change in the material culture, as well as in settlement pattern, in the Southern Atbai. First, it appears that the Atbara River Valley was no longer considered optimal for habitation, since all sites are now found on the western steppe, between the Atbara River Valley and the Gash Delta (Marks, Mohammed-Ali and Fattovich 1986; Marks and Sadr 1988), although none appears to have been located within 30 km of the present Gash channel (Sadr 1986; 1988). These sites of the Saroba Phase (Fattovich, Marks and Mohammed-Ali 1984), ranging in size from two tenths of a hectare to one hectare, are easily recognized by their ceramics. These are sand tempered, unburnished and unslipped; they have a very limited range of impressed motifs, apparently covering the complete vessels. These motifs are mainly made by rocker-stamping and are similar to some found in the Khartoum Mesolithic, although wavy-line and dotted wavy-line motifs are absent. Thus, only in a general way do they fit into the Khartoum Horizon style (Hays 1971).

Being located on the steppe, at least 10 km away from the Atbara River and more so from the Gash River, these folk apparently did not exploit the riverine environments to any extent but, instead, intensified their exploitation of the wooded savannah fauna – mainly small antelopes, although warthog and some larger antelopes were also hunted (Peters 1986a). Like those before them, they had relatively little equipment implicitly associated with plant processing, although some grinding stones are present at all sites.

At about 5,100 B.P., just at the end of the Early Holocene wet phase, we can see some significant changes in cultural inventory. Although only a single site is now known for this period, the Saroba/Kassala Transitional Phase (Fattovich, Marks and Mohammed-Ali 1984), it clearly indicates an increasing material complexity but, seemingly, within the same economic adaptation, emphasizing the hunting of steppe mammals and lacking any hint of domesticated stock (Peters 1986a). The known site of this period is 50% larger than the largest Saroba Phase site, has 30 cm of cultural deposit, as opposed to an average of 10 cm for the earlier sites, and there is a marked increase in the number of types of chipped stone tools, as well as ceramic wares.

The most obvious changes can be seen in the ceramics. Along with the typical Saroba Phase sherds, there are now both a rare black burnished ripple ware and, more importantly, large numbers of a fairly thin-walled, large vessels with unburnished and unsmoothed scraped interiors and exteriors. The size of the vessels alone suggest somewhat less mobility than before and the high density of sherds at the site indicates more intense occupation or reoccupations of the site than was seen at Saroba Phase sites.

The lithic materials show a shift away from backed microliths, often geometric, to a dominance of processing tools. For the first time since the pre-ceramic



period, there were excellently made scrapers and scaled pieces, quite credible perforators, and even a range of finely made denticulate endscrapers. All this suggests, at least, more maintenance work and secondary production at this site than was seen at the earlier Saroba Phase sites.

Within about 500 years, at 4,500 B.P., only a few hundred years after the postulated beginning of the Mid-Holocene dry phase, there was a radical change in most areas of the local prehistory. Only four aspects remained essentially as contact between the transitional phase and the Butana Group of the early Kassala Phase which developed out of it (Fattovich, Marks and Mohammed-Ali 1984). There was a continuity in the dominance of unburnished, unsmoothed scraped wares; the chipped stone assemblages remained very similar; sites still occurred on the steppe; and, meat was still obtained only from wild animals.

On the other hand, a great number of changes are apparent. Among them, the following seem most striking:

- the presence of sites in both the Atbara River Valley and on the steppe to within 30 km of the present Gash Delta;
- an incredible increase of site size, from 1.5 hectares in area with 30 cm of cultural deposits at the transitional site to as much as 11 hectares in area and 260 cm of cultural deposits;
- the appearance of a number of site types, from large habitation sites to highly specialized sites for ceramic production or bifacial pick manufacture;
- a marked increase in the number of ceramic wares, from three in the Transitional Phase to as many as six in the Butana Group of the Early Kassala Phase;
- the production of very large, thick-walled scraped vessels, as well as a range of thin, black burnished and red topped/incised fine wares;
- the appearance in the early Kassala Phase of polished stone mace-heads, imported from the Red Sea Hills area, and the presence of locally produced agate lip plugs, both of which suggest increased social stratification;
- the appearance of a range of locally produced polished stone tools, including axes and adzes;
- a marked increase in the number of ground stone pieces.

All these changes took place within a context of continuity in faunal exploitation (Peters 1986a). All evidence points to the continued hunting of steppe animals. Not a single element of domestic fauna occurred in the lower levels of the Butana Group sites. While a very few did occur in their upper levels, perhaps 300 to 500 years after their founding, even then they were rare and suggest little economic importance. In this regard, the recent suggestion by Haaland that these large village sites were made by Cushitic speaking pastoralists who were "being forced to rely increasingly on cultivation" (1988: 230) is not only without empirical foundation but the available data, while not relevant to what these folk might have spoke, certainly documents that pastoralism was not present before or during the beginning of this explosion of cultural complexity. How then may we account for these radical changes, if not through shifts in economic adaptations? Why was there such an apparent development of marked social



stratification and sedentism? There are some hints. While the faunal exploitation did not change, the increased number of ground stone pieces and the introduction of large bifacial and polished tools suggests that plants had become much more important than previously. Unfortunately, we have no direct evidence for the introduction of domestic cereals at this time but it is likely that they, in fact, played a crucial role in this cultural transformation. Yet, why then and not before, since both domestic animals and postulated cereal cultivation has been claimed for the central Nile Valley at comparable or somewhat earlier dates (e.g. Gautier 1984; Peters 1986b). Can the temporal correlation between regional climatic change and culture change be documented here?

If the timing of the major changes in settlement location and material culture complexity is matched against regional climatic change, it is apparent that only during the shift to the Mid-Holocene dry phase can one find a correlation; in the other two earlier cases marked changes took place within a single climatic period. In the latter case, can the onset of a dry phase be causative to any great extent? If so, it was not any essentially arbitrary line between the Early Holocene wet phase and the Mid-Holocene dry phase, but rather some long term regional trends which partly might be causative in this case.

In the broadest sense, the decrease in precipitation near the end of the Early Holocene wet phase, as it approached a level sufficiently low to recognize the onset of the Mid-Holocene dry phase, at about 5,000 B.P., undoubtedly played a role in lowering the volume of the seasonal Gash discharge and, in doing so, initiating the shift of its delta toward the northeast. Beyond that, however, it is unlikely that it had any direct effect on local culture change.

Rather, the shift of the Gash end the resulting and of heavy seasonal inundation in the drier western steppe, opened the area to increased plant exploitation. It appears that this was already under way during the Saroba/Kassala Transitional Phase – that is, still within the Early Holocene wet phase – but that it virtually exploded during the subsequent early part of the Kassala Phase. At that time, the large, deeply stratified sites were located on or adjacent to the permeable soils left by the earlier Gash overbank flooding. It seems likely, therefore, that the local opening up of arable lands was a primary factor involved and that this was not a regional phenomenon but was the result of strictly local microgeomorphological shifts in the Gash River channels.

Although this cannot yet be proven, it is highly likely that once the Gash Delta established itself essentially parallel to the Atbara River, with its northern end abutting the Red Sea Hills, it opened an avenue of contact between the Southern Atbai and Northeastern Sudan. This can be seen in the presence of polished stone artifacts which come from the Red Sea Hills and appear first during the Early Kassala Phase. Their presence might suggest that an important factor in the rapid growth of social complexity was this new economic interaction. In this case, it would mean that either the southern Red Sea Hills area contained societies already more complex than their contemporaries in the Southern Atbai or that development there was essentially parallel to that in the Southern



Atbai and that interaction accelerated the growth of complexity in both areas. Only additional field work in that area will resolve this but, without doubt, the extremely rapid growth of village life and social complexity in the Southern Atbai did not take place in a void.

In sum, we can find no good causative correlation between significant culture change in the Southern Atbai during the Early and Mid-Holocene and regional climatic change. At best, like Spinoza's God, it set a process into motion, but it was a local variations in microenvironmental conditions which played the central role in permitting acceptance and/or intensification of plant exploitation which, apparently, provided the impetus for the dramatic cultural changes seen at 4,500 B.P.

## References

- ADAMSON, D.A. 1982. The integrated Nile. In: M.A.J. Williams and D.A. Adamson (eds.), *A land between two Niles. Quaternary geology and biology of the Central Sudan*: 221 - 234. Rotterdam: A.A. Balkema.
- ARKELL, A.J. 1949. *Early Khartoum*. Oxford: Oxford University Press.
- 1953. *Shaheinab*. Oxford University Press.
- CANEVA, I. 1988. The cultural equipment of the Early Neolithic occupants of Geili. In: I. Caneva (ed.), *El Geili: the history of a Middle Nile environment 7,000 B.C. – A.D. 1,500*: 65 - 150. Oxford: British Archaeological Reports International Series 424.
- CHŁODNICKI, M. 1982. Z badań nad ceramiką z osady neolitycznej w Kadero, Sudan. *Przegląd Archeologiczny* 30: 81 - 117.
- FATTOVICH, R., A.E. MARKS and A. MOHAMMED-ALI. 1984. The archaeology of the Eastern Sahel, Sudan: preliminary results. *The African Archaeological Review* 2: 173 - 188.
- GAUTIER, A. 1984. The fauna of the Neolithic site of Kadero (Central Sudan). In: L. Krzyżaniak and M. Kobusiewicz (eds.), *Origin and early development of food-producing cultures in North-Eastern Africa*: 318 - 320. Poznań: Polish Academy of Sciences, Poznań Branch, and Poznań Archaeological Museum.
- HAALAND, R. 1987. *Socio-economic differentiation in the Neolithic Sudan*. Oxford: British Archaeological Reports International Series 350.
- HAYS, T.R. 1971. *The Sudanese Neolithic: a critical analysis*. Unpublished Ph.D. thesis. Dallas: Department of Anthropology, Southern Methodist University.
- MARKS, A.E. 1987. Terminal Pleistocene and Holocene hunters and gatherers in Eastern Sudan. *The African Archaeological Review* 5: 79 - 91.
- MARKS, A.E. and K. SADR. 1988. Holocene environments and occupations in the Southern Atbai, Sudan: a preliminary formulation. In: J.F.R. Bower and D. Lubell (eds.), *Prehistoric cultures and environments in the Late Quaternary of Africa*: 69 - 70. Oxford: British Archaeological Reports African Series.
- MARKS, A.E., J. PETERS and W. VAN NEER. 1987. Late Pleistocene and Early Holocene occupations in the Upper Atbara River Valley, Sudan. In: A.E. Close (ed.), *Prehistory of arid North Africa. Essays in honour of Fred Wendorf*: 137 - 161. Dallas: Southern Methodist University.
- MARKS, A.E., A. MOHAMMED-ALI and R. FATTOVICH. 1986. The archaeology of the Eastern Sudan: a first look. *Archaeology* 39(5): 44 - 50.
- NORDSTRÖM, H.-A. 1972. *Neolithic and A-Group sites*. The Scandinavian Joint Expedition to Sudanese Nubia Publications 3(1). Stockholm: Scandinavian University Books.
- PETERS, J. 1986a. *Bijdrage tot de archeozoologie van Soedan en Egypte*. Ph.D. Dissertation, Rijksuniversiteit Gent, Fakulteit der Wetenschappen. Unpublished manuscript.



- 1986b. A revision of the faunal remains from two Central Sudanese sites: Khartoum Hospital and Esh Shaheinab. *Archaeozoologia. Mélanges publiés à l'occasion du 5<sup>e</sup> Congrès International d'Archéozoologie. Bordeaux 1986*: 11 - 35.
- SADR, K. 1986. Preliminary report on the archaeological settlement patterns of the Kassala area. *Annali del Istituto Universitario Orientale* 46(1): 1 - 34.
- 1988. *The development of nomadism: the view from ancient Northeast Africa*. Ph.D. Dissertation, Southern Methodist University. Ann Arbor: University Microfilms International.
- WHITEMAN, A.J. 1971. *The geology of the Sudan Republic*. Oxford: The Clarendon Press.
- WICKENS, G.E. 1982. Paleobotanical speculations and Quaternary environments in the Sudan. In: M.A.J. Williams and D.A. Adamson (eds.), *A land between two Niles. Quaternary geology and biology of the Central Sudan*: 23 - 51. Rotterdam: A.A. Balkema.