ISSN 1120-5679

SAHARA

Preistoria e storia del Sahara
Prehistory and history of the Sahara
Préhistoire et histoire du Sahara

Centro Studi
Luigi Negro

4

1991

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Mesolithic Fishing along the Central Sudanese Nile and the Lower Atbara

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Riassunto

Gli scavi dell'Ospedale di Khartoum e di siti analoghi nel Sudan Centrale hanno dimostrato che nel Mesolitico l'utilizzo degli animali si caratterizza per la grande importanza delle risorse fluviali: i pesci, i rettili acquatici e i mammiferi che frequentavano le pianure alluviali e le foreste sono i vertebrati dominanti nella fauna. Fino ad ora, i resti di pesci da questi siti del Mesolitico di Khartoum non sono mai stati studiati in dettaglio e le informazioni sulle specie catturate, sulla distribuzione delle dimensioni, sui metodi di cattura e di preparazione mancano quasi del tutto. Le analisi dei resti dei pesci da Abu Darbein, El-Damer e Aneibis dimostrano che un'ampia varietà di specie veniva catturata dagli abitanti del luogo. La composizione dell'ittiofauna riflette uno sfruttamento che corrisponde ai cambiamenti di livello dei fiumi Nilo e Atbara e alla disponibilità delle risorse. Le uniche testimonianze archeologiche di attrezzatura per la pesca sono costituite da alcune punte d'osso acuminate. Tuttavia, sia lo spettro della fauna che la distribuzione delle dimensioni implicano un'attrezzatura molto diversificata, che comprende le reti. Probabilmente, zattere o barche fecero la loro comparsa nel Sudan Centrale circa 8000 anni fa.

Summary

Excavations at Khartoum Hospital and related sites in Central Sudan have shown that mesolithic animal exploitation is characterized by an emphasis upon riverine resources: Fish, aquatic reptiles and mammals frequenting riverine grassland and gallery forest are the dominant vertebrates in the faunal samples. Up to now, the fish remains from these Khartoum Mesolithic sites have never been studied in detail and information about the species caught, the size distribution of the fish, the ways of fish procurement and preparation is almost completely lacking. The analysis of the fish remains from Abu Darbein, El-Damer and Aneibis illustrate that a wide variety of species were caught by the site inhabitants. The composition of the ichthyofaunas reflects an exploitation in response to changes in the Nile and Atbara river levels and resource availability. Archaeological evidence for fishing equipment is limited to a number of fragmentary barbed bone points. However, both the spectrum and the size distribution of the fish imply a much more diversified set of fishing gear including nets. Most likely, rafts or boats made their appearance in the Central Sudan some 8000 years ago.

Résumé

Les fouilles de l'Hôpital de Khartoum et de sites analogues dans le Soudan central ont montré qu'au Mésolithique l'exploitation des animaux se caractérisait par l'importance des ressources liées au fleuve: poissons, reptiles aquatiques, et mammifères fréquentant les plaines alluviales et les forêts-galeries constituent l'échantillon le plus abondant dans les listes de faunes. Les restes de poissons provenant de ces sites du Mésolithique de Khartoum n'ont jusqu'ici pas été étudiés en détail, et l'on manque à peu près complètement d'informations sur les espèces capturées, la distribution des tailles, les modes de capture et de préparation. Nous analysons ici les restes de poissons de Abu Darbein, de El-Damer et d'Aneibis. Ils illustrent une grande variété d'espèces capturées. La composition de l'ichtyofaune reflète un mode d'exploitation qui s'adaptait aux changements intervenant dans le niveau des eaux du Nil et de l'Atbara, et dans la nature des ressources disponibles. Les seuls documents concernant l'équipement de pêche sont quelques fragments de pointes barbelées en os. Cependant, le spectre faunique et la distribution des tailles des poissons impliquent un équipement de pêche beaucoup plus diversifié, incluant des filets. Très probablement, des radeaux ou des embarcations firent leur apparition au Soudan central il y a quelque 8000 ans.

1. *Introduction*

The earliest evidence for a post-Pleistocene occupation in the Central Sudanese Nile valley comes from a series of sites that extend from Kosti, 300 km south of Khartoum, to about the 5th cataract, *ca.* 400 km to the north of Khartoum (Fig. 1). These sites all contain ceramics broadly of the type described by Arkell (1949) as belonging to the Khartoum Mesolithic (or Early Khartoum). Although only a few radiocarbon dates of an early occupation are available, they indicate its appearance between *ca.* 9600 BP and 8500 BP, most sites dating between 8000 and 6000 BP (Marks *et al.*, 1985). As indicated by the faunal remains, there is evidence

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at all these sites for hunting and gathering, with an emphasis upon riverine resources. Unfortunately, faunal analysis focused on the remains of terrestrial vertebrates, in particular mammals, whereas the considerable amounts of fish bones were left unstudied. For example Bate (1949) relates that at Khartoum Hospital the fish remains include a very large quantity of bones, totalling a greater number than those of any other group of vertebrates preserved in the collection. Summing up, information on mesolithic fishing in Central Sudan is very limited. Therefore the extensive faunal samples with numerous fish bones collected by members of the Atbara Research Project (Dir. Prof. Dr R. Haaland, Univ. of Bergen, Norway, and Dr A.A. Magid Osman, Univ. of Khartoum, Sudan) at El Damer, Abu Darbein and Aneibis offer a unique opportunity to gain more insight into fish procurement along the Central Sudanese Nile and the Lower Atbara some 8500 to 7500 years ago.

2. *The ichthyofaunas from Aneibis, Abu Darbein and El-Damer*

The sites of Aneibis, Abu Darbein and El Damer are situated between the 5th and the 6th cataract (Fig. 1) and are located on gravel ridges that represent old river terraces. They are bordered by an alluvial plain towards the river (Nile/Atbara) and by a desert plateau away from the river. According to A.A. Magid and A. Al-Nadi (*in litt.*) large floodplains were present near Aneibis and El-Damer during mesolithic times, whereas at Abu Darbein, the alluvial plain must have been considerably more narrow. The available radiocarbon dates suggest that Abu Darbein and El-Damer were inhabited during the second half of the 9th till the first half of the 8th millennium BP. The occupation of Aneibis is dated to the 8th millennium BP (R. Haaland, *in litt.*: Abu Darbein: 8500 ± 100 BP - 7700 ± 140 BP; El-Damer: 8390 ± 50 BP - 7690 ± 100 BP; Aneibis: 7850 ± 140 BP - 7290 ± 150 BP).

Sampling of the bone material was done by handpicking from screens and no doubt some smaller specimens have been overlooked. The mammalian fauna is rich, the list of species being very similar to the one known from other Sudanese mesolithic occurrences (cf. Peters, 1989, Table 2; in press). Besides mammals and fish, aquatic reptiles such as Nile monitor (*Varanus niloticus*, Nile softshelled turtle (*Trionyx triunguis*) and Nile crocodile (*Crocodylus niloticus*) were frequently caught by the site inhabitants.

Fish bones constitute a major component of the fauna in all three assemblages. In contrast to the mammalian collections which produced low identification rates (below 15%), more than 80% of the fish bones could be identified to the family and/or genus level. Fig. 2 presents information on fragment counts (FC), minimum number of individuals (MNI) and bone weight (in gramm) for eight major fish groups.

Both fragment counts and minimum number of individuals suggest that fishing focused on *Synodontis* and *Clarias* and, depending on the site, on *Lates* and *Bagrus*. If bone weight is considered an equivalent for meat yield, it can be concluded that *Synodontis*, *Clarias* and *Lates* provided over 80% of the fish protein at Aneibis. At Abu Darbein, *Synodontis*, *Bagrus* and *Clarias* made out more than 80% of the local fish menu, while at El-Damer *Clarias*, *Bagrus* and *Lates* accounted for most of the fish meat. However, such «calculations» must be considered rough estimates, simply because skeletal preservation differs from species to species. Thus fish species with more robust skeletal elements such as for example *Synodontis*, *Clarias* and *Lates* may be better represented in fossil assemblages than species with predominantly brittle bones as for instance in Mormyrids. Other biasing effects may be due to the sampling methods or may be related to the so-called *facteur de reconnaissance sensu* Bouchud (1970), which arises from the fact that certain bone elements are more easily recognised than others (Von Den Driesch, 1986: 7-9; Gautier and Van Neer, 1989: 148). Unfortunately, a quantification of all these biasing effects is impossible.

The size distribution of the major fish groups is given in fig. 3. Four or five categories are proposed depending on the size of the fish (cf.

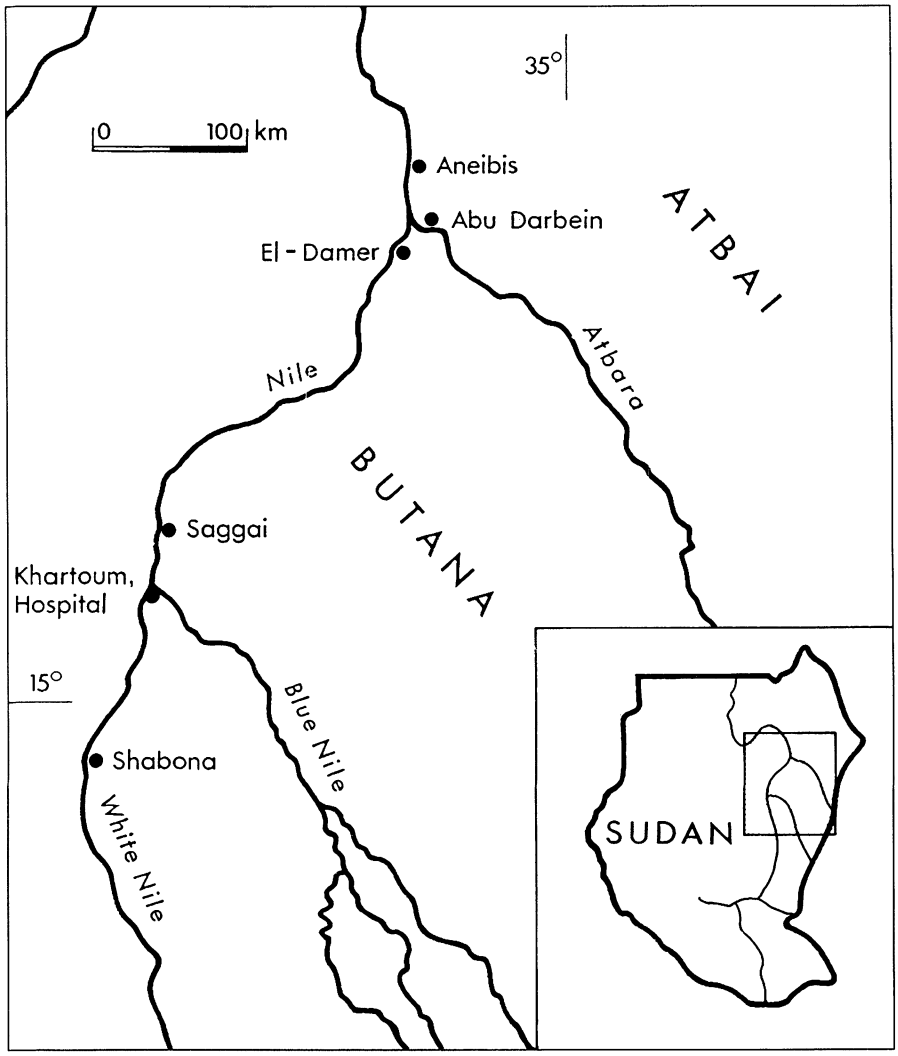


Fig. 1. Map of the Central Sudan with the location of the sites mentioned in the text. Inset shows map relative to the Sudan.

Gautier and Van Neer, 1989: 126): small to very large for species with a maximum Total Length below 1 m, and very small to very large for species which grow larger than 1 m. This procedure was carried out for all identifiable skeletal elements within each excavation unit. The resulting minimum number of individuals for each archaeological unit have been added and the percentage frequencies calculated. From these it becomes obvious that remains of adult fish dominate the assemblages. Immature fish were also caught, remains of hatchlings and fingerling (= smallest size class) are rare in the samples.

3. Season and place of capture of the fish

In many fluviatile systems in Africa traditional fish procurement is related to the annual hydrological cycle. The arrival of the floodwaters causes a temporary expansion of the water area adjacent to a river or a lake. During the following dry period most of the floodplain is drained leaving a network of depression pools, lagoons and swamps, some of which persist until the next flood (Welcomme, 1979: 94). At the beginning of this cycle, many fish species undertake lateral migrations into these shallow flooded areas to feed and spawn, both adults and newborns benefiting from the mass of food and shelter available (Daget, 1954: 21-23). As the plain dries out, most of the fish migrate back to the major waterbody, but part of the community remains in the standing waters. As is still the case in Africa a good deal of fishing will take place at the beginning of the flooding phase. However, by far the most productive time for traditional fish procurement is when the waters are receding and at low waters in the dry season (e.g. Boulenger, 1901: XXV; Sundström, 1972: 17; Stewart, 1989: 70, with references).

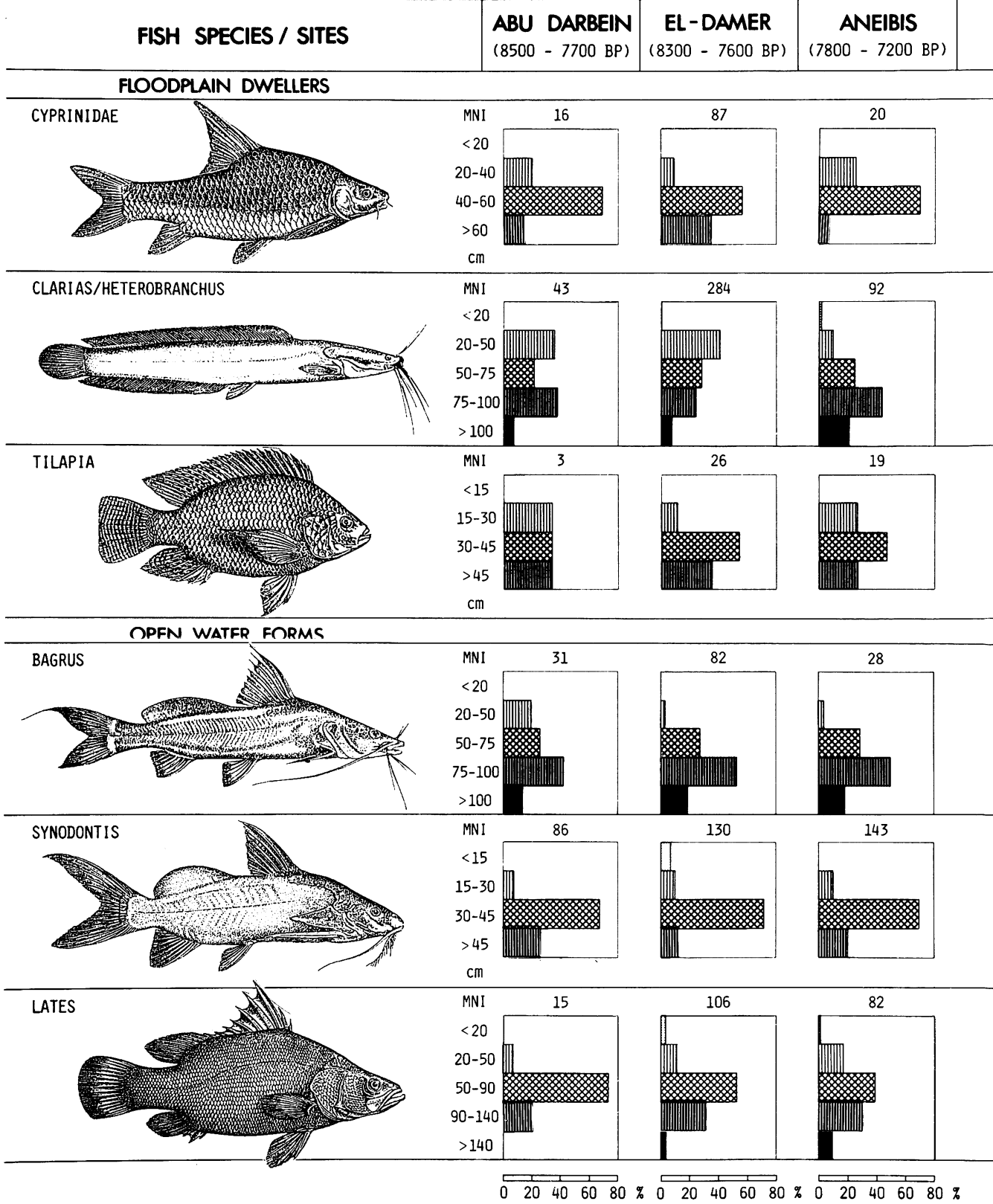


Fig. 2. Absolute and percentage frequencies of the major fish genera/families from Aneibis, Abu Darbein and El-Damer on the basis of fragment counts, minimum number of individuals and bone weight. Fish species redrawn after Boulenger (1907).

Fig. 3. Size distribution in percent of six major fish genera/families from Abu Darbein, El-Damer and Aneibis. Fish species redrawn after Boulenger (1907).

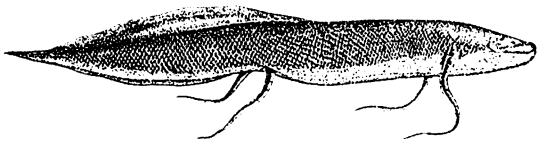
FC = FRAGMENT COUNTS (AN: 1186; AD: 588; ED: 2584)

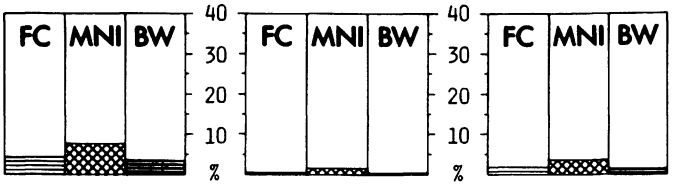
MNI = MIN. NUMBER OF INDIVIDUALS (AN: 492; AD: 237; ED: 963)

BW = BONE WEIGHT (AN: 1764 GRAMM; AD: 701 GRAMM; ED: 2574 GRAMM)

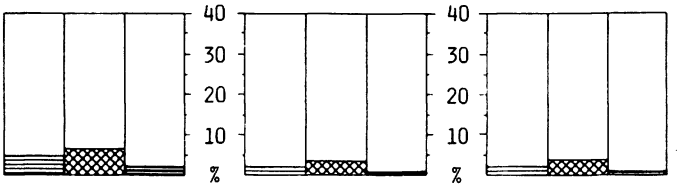
FISH SPECIES / SITES	ANEIBIS (7800 - 7200 BP)	ABU DARBEIN (8500 - 7700 BP)	EL-DAMER (8300 - 7600 BP)

PROTOPTERUS

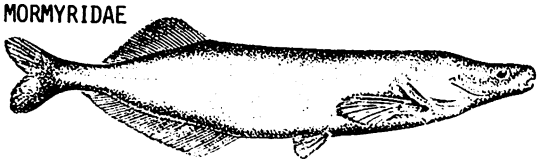


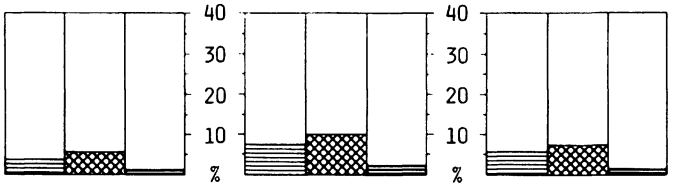


POLYPTERUS

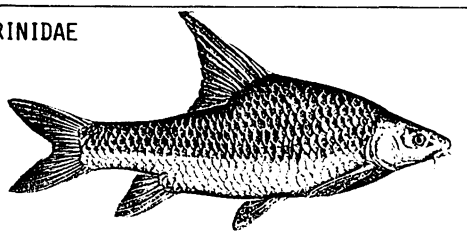


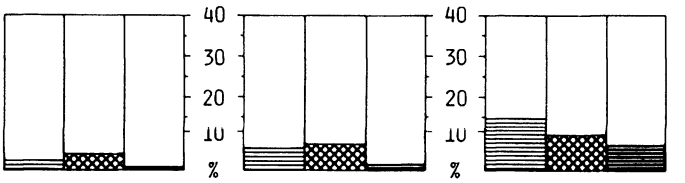
MORMYRIDAE



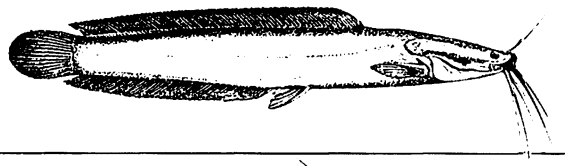


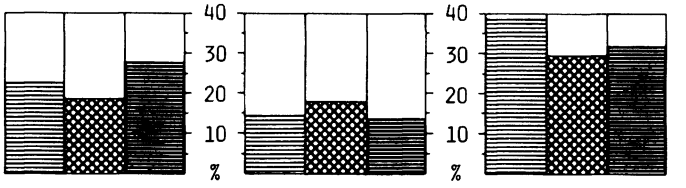
CYPRINIDAE



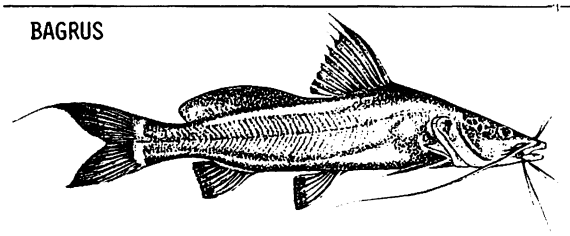


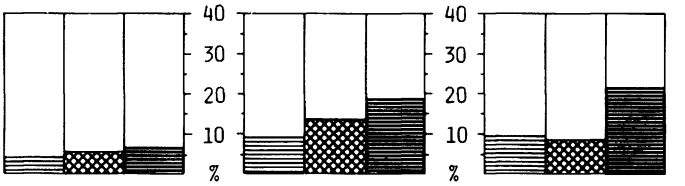
CLARIAS/HETEROBRANCHUS



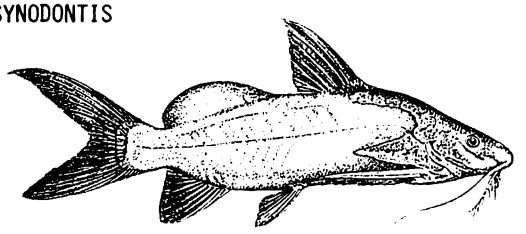


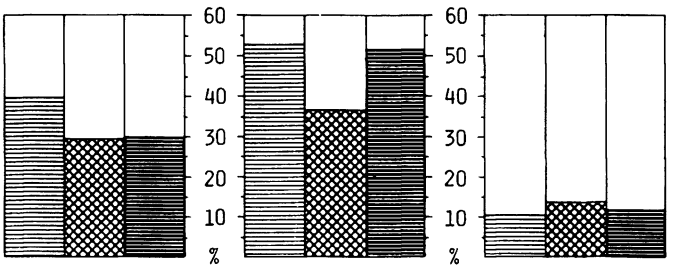
BAGRUS



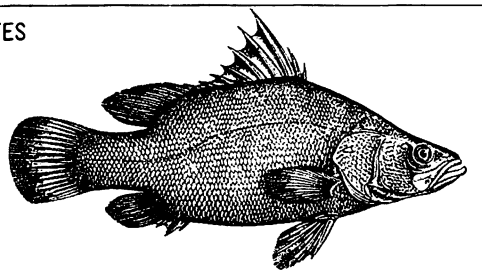


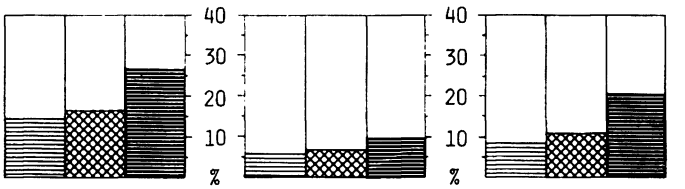
SYNODONTIS



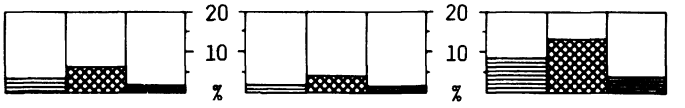


LATES





OTHERS



At the onset of the high waters migrating fish are caught with a variety of techniques. Depending on the local situation, weirs, nets, traps, baskets and spears are used to catch migrating Mormyrids, *Alestes*, *Barbus*, *Labeo*, *Clarias*, *Tilapia* etc. (cf. Gautier and Van Neer, 1989; Stewart, 1989: 72, with references). When the waters start to recede, two patterns of exploitation become important: trapping fish in their seasonal movements in increasingly shallow waterways, and catching fish from pools that have been isolated from the main waters. Ethnographical evidence from all over Africa suggests that weirs, stationary baskets, thrust baskets, drag baskets, nets, spears, clubs, poison or even bare hands are used to accomplish this (see references in Von Brandt, 1984; Gautier and Van Neer, 1989; Stewart, 1989). Fish species caught this way include *Protopterus*, *Polypterus*, *Heterotis*, *Labeo*, *Barbus*, *Clarias*, *Synodontis*, *Tilapia* and occasionally *Lates* (Molloy, 1956: 58-59). For many traditional fishing methods large parties of women and children must be involved to obtain good results (e.g. Bloss, 1945).

As said fish species such as *Clarias*, *Barbus*, *Labeo* and *Tilapia* undertake spawning runs when the floodwaters arrive. For *Lates*, *Bagrus*, *Synodontis* and *Hydrocynus* detailed information on their spawning behaviour is lacking for the (Central Sudanese) Nile and the Atbara, but observations made elsewhere confirm that they lay their eggs in the river or eventually in smaller streams that are well-aerated (e.g. Daget, 1954). If adult *Lates*, *Bagrus*, *Synodontis* and *Hydrocynus* visit the alluvial plain at all, their stay is of short duration and limited to the deeper parts, f.e. channels. However, newborns and juveniles of these species are known to frequent the backwaters for some time of the year. When the waters recede adult fish migrate back towards the main waterbody before the juveniles (Gautier and Van Neer, 1989: 141, 144, with references).

For the Central Sudanese Nile valley Clark (1989) recently postulated that mesolithic fish procurement must have been an important dry season activity that took place as follows: «Creeks would have been dammed and fish caught with spears and, possibly, basket traps or simply by reducing oxygen in the water by trampling the mud and so stupefying the fish». Quite a determinate statement if one considers the «wealth» of archaeozoological information available to the author: «...The largest components of the fauna (i.e. from Shabona, excavated in 1973) are the remains of numerous fish and tortoises, not yet specifically identified» (Clark, 1989: 405)! As will be demonstrated mesolithic fish procurement clearly went beyond the level suggested by Clark.

Judging from the composition of the ichthyofaunas (Fig. 2) and the size distribution within the major fish genera/families (Fig. 3) from Abu Darbein, El-Damer and Aneibis, three peaks in fishing activities can be postulated. In all three sites the relative abundance of medium to very large *Clarias* and large to very large cyprinids (*Barbus*, *Labeo*), *Tilapia* and a few other species indicate that a first peak may have coincided with the arrival of the floodwaters when the spawning runs of the adults took place. Secondly, the considerable numbers of very small and small individuals of a wide variety of species point to the exploitation of the backwaters after the floodplain had started to dry up. These activities may have taken place during the dry season. Finally, adult *Synodontis*, *Bagrus* and *Lates* are open water forms and therefore must have been caught mainly in the Nile and Atbara river channels. As is still the case today, fishing in the main channel will have been practised when the water level was low, for reasons of access, but also because the main waters are less turbulent then. Moreover, fishing in high waters is much less effective since the animals are more dispersed (cf. Stewart, 1989; Van Neer, 1989). All in all the composition of the mesolithic fish faunas is in accordance with what we know about traditional riverine fish procurement in present-day subsaharan Africa.

4. Fishing techniques and fish processing

The ichthyofaunas from Abu Darbein, Aneibis and El-Damer indicate that all the facies of the Nile and the Atbara were exploited by the site inhabitants. Consequently, a diversified set of fishing equipment must have

been available. As seen, fish procurement on the floodplain can be carried out with a number of implements such as thrust baskets, weirs etc. Unfortunately, archaeological evidence for such fish-catching devices is limited while virtually all traditional implements are constructed of grass, fibres, reeds or wood, none of which preserve except under special circumstances. With the exception of bone spear points and harpoons, evidence for fishing gear that can be used in shallow and standing waters has not been recovered from Khartoum Mesolithic sites.

Fishing equipment suitable for the capture of fish inhabiting the deeper parts of a river include harpoons, lines, hooks and nets. Bone harpoons occur in all Khartoum Mesolithic sites, but direct evidence for other equipment is lacking. However, a number of stone implements (e.g. Arkell, 1949: 68; pl. 40), clay artefacts (e.g. Arkell, 1949: 79) and perforated potsherds showing traces of secondary use (Haaland, *in litt.*) can be interpreted as fishing-line sinkers. Line fishing may have been practised with gorges or gorge-like devices because hooks have not been found in Khartoum mesolithic sites. This is in contrast to the younger Khartoum Neolithic levels which contain fish hooks made of Nile bivalves (Arkell, 1953). According to us, the use of nets can be deduced from the ichthyofaunal spectrum. To a certain extent, the use of nets might also explain the abundance of *Synodontis* and other siluroid remains in our samples, since catfish become quickly entangled because of their spines. On the other hand siluroids simply may have been the most common fish at the junction of the Nile and the Atbara.

With the possible exception of hook and line, the successful use of harpoons and especially nets is strongly correlated with the presence of rafts and boats (e.g. Sundström, 1972: 22; Van Neer, 1989). Harpoon fishing from the shore is possible, but some fish, in particular large Nile perch, occur only exceptionally inshore. In this respect, the size distribution of Nile perch in the three assemblages is quite interesting. At Abu Darbein (8500-7700 BP), only one Nile perch with an estimated total length (TL) of 1,20 m was found, the others ranging from *ca.* 30 to 100 cm TL (Fig. 3). Apparently the site inhabitants of Abu Darbein could not obtain the very large Nile perch - provided that such animals were present in the Atbara - and the absence of adequate fishing gear i.e. rafts or boats must be considered. In the samples from the younger sites at El-Damer (8300-7600 BP) and Aneibis (7800-7200 BP), Nile perch with a total length up to 1,80 m are recorded, 30 to 40 % of the perch surpassing 90 cm TL. Since we cannot imagine how this could have been accomplished by the mesolithic fisherman without the help of rafts or boats, we conclude that such equipment must have been known in the Central Sudanese Nile valley as early as 8000 years ago.

The analysis of the frequencies of the body parts by which the different fish species are represented may provide insight into the way animals have been processed and utilised by prehistoric people. For this purpose, various skeletal elements are lumped into rough units that do not necessarily correspond to anatomical entities used in comparative anatomy, but which are chosen in a way that they may reflect techniques of processing and preparation, or introduction of selected body parts at the site. Because a detailed account of the intraskeletal distribution of the fish from Abu Darbein, El-Damer and Aneibis lies out of the scope of this paper, we will summarize the results in a few lines. On present evidence we suppose that the fish were brought to the site *in toto* and that butchery practices such as decapitation or the removal of the fins did not take place elsewhere. Fish may have been prepared for consumption or preservation in different ways, but only one can be demonstrated on the basis of archaeozoological evidence: the roasting of smaller fish on their whole in hot ashes or before a fire. This can be deduced from concentrations of bones of small to medium sized fishes exhibiting a typical colouring pattern according to their anatomical position in living animals: burnt (black to white) if located externally and not embedded in muscle portions (f.e. pectoral spines, fin rays) *versus* unburnt (brownish) if covered by meat (f.e. vertebrae). Other ways of fish processing and/or preservation cannot be recovered from the material. It is likely, however, that the methods used were comparable to the traditional techniques of drying and smoking still practised today (e.g. Sundström, 1972: 29, with references).

Acknowledgements

The author is indebted to Prof. Dr R. Haaland (University of Bergen, Norway) and Dr A.A. Magid Osman (University of Khartoum, Sudan) for permission to study the faunal remains collected by the Atbara Research Project and to provide him with the necessary information concerning the sites. Many thanks are due to Prof. Dr A. von den Driesch (Universität München) for checking the identification of doubtful specimens, for her suggestions concerning the treatment of the data and for reading the manuscript. M. Schulz (München) is thanked for the fine drawings.

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