Skeletons in her Cupboard

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Contents

Mesolithic fishing at the confluence of the Nile and the Atbara, Central Sudan

Joris Peters and Angela von den Driesch

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. Until 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, fishing methods and fish 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. 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.

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 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. According to E. Trewavas, eight genera of fish were present in this material, all of which are still commonly found in the Nile (Table 1). Besides, A.J. Arkell distinguished spines of *Bagrus* during the excavations (Bate 1949: 17). Finally, W. Van Neer recognised two tooth plates of African lungfish, *Protopterus aethiopicus* among the fish remains that were left in the mammalian collection (Van Neer *in* Peters 1986: 13). At Shabona, a Mesolithic site south of Khartoum, fish bones dominate the vertebrate fauna but no identifications are given (Clark 1989). At Saggai, Van Neer (*in* Gautier 1983: 62–65) recognised 9 genera among the numerous fish remains (Table 1). 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. Dr. R. Haaland, Univ. of Bergen - Norway) at El Damer, Abu Darbein and Aneibis offer a unique opportunity to gain more insight into fishing along the Central Sudanese Nile and the Lower Atbara some 8600 to 7600 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 Nile 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 (pers. comm.), large floodplains were present near Aneibis and El Damer during Mesolithic times,

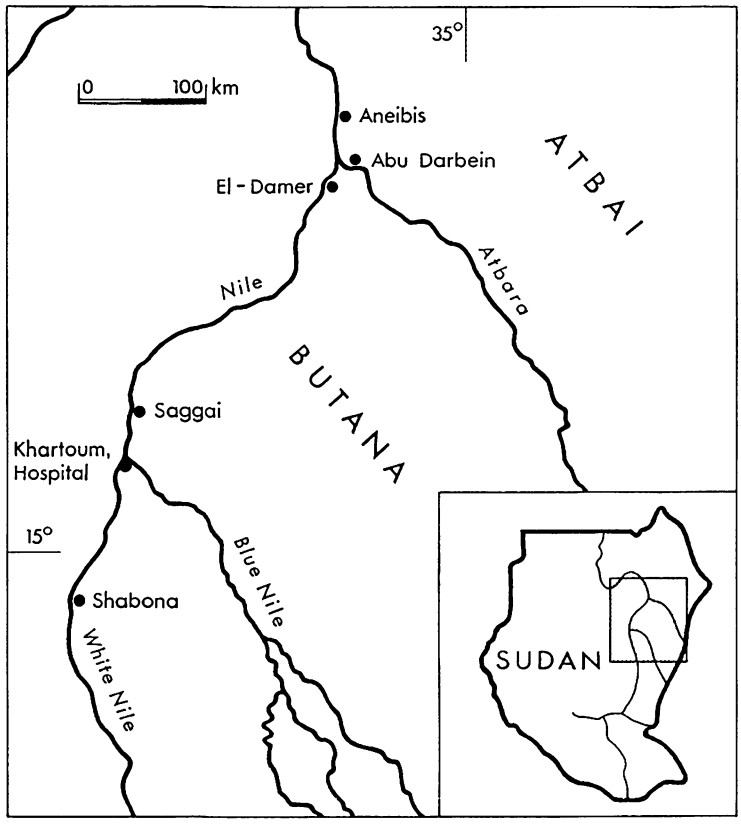

Fig. 1: Map of the Central Sudan with the location of the sites mentioned in the text. Inset shows map relative to the Sudan.

whereas at Abu Darbein, the alluvial plain must have been considerably more narrow. The ^{14}C dates available for Abu Darbein range between 8640 ± 120 and 8330 ± 100 BP. The Mesolithic occupation at El Damer is dated between 8040 ± 120 and 7780 ± 110 BP. At Aneibis, the archaeofauna was collected in area 4, which was inhabited mainly from 7890 ± 100 to 7570 ± 60 years ago (Haaland and Magid 1992).

Table 1. Overview of the different fish genera recognised in five Khartoum Mesolithic sites: Khartoum Hospital (KH), Saggai (SA), Aneibis (AN), Abu Darbein (AD) and El Damer (ED)

Fish genera/Sites	KH	SA	AN/AD/ES
Protopterus (African lung fish)*	+	+	+
Polypterus (bichir)	+	+	+
Heterotis (thick-skinned fish)	-	-	+
Hyperopisus	-	+	+
Mormyrops	-	-	+
Gymnarchus (freshwater rat-tail)	-	-	+
Hydrocynus (tiger-fish)	+	+	+
Alestes (pebbly fish)	-	-	+
Distichodus (rough cast fish)	-	-	+
Citharinus (moon fish)	-	-	+
Labeo (Nile carp)	+	-	+
Barbus (barbel)	-	-	+
Clarias (eel catfish)	+	+	+
Heterobranchus (eel-like fattyfin catfish)	-	-	+
Bagrus (Forskal's catfish)	+	+	+
Clarotes (spiny catfish)	+	-	+
Auchenoglanis (black spotted catfish)	-	-	+
Synodontis (shield head catfish)	+	+	+
Malapterurus (African electric catfish)	-	-	+
Lates (Nile perch)	+	+	+
Tilapia (perch)	+	+	+
Tetraodon (striped puffer)	-	-	+

* Vernacular names are taken from Amirthalingam and El Yasaa Khalifa (1965).

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 soft-shell (*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 30%), more than 80% of the fish bones could be identified to the family and/or genus level. Table 1 presents a list of the fish genera identified from the sites discussed. Those recorded from other Khartoum Mesolithic occurrences (Khartoum Hospital, Bate 1949, Van Neer *in* Peters 1986; Saggai, Van Neer *in* Gautier 1983) have been added. The composition of the three ichthyofaunas based on fragment counts (FC) is given in Table 2. Fig. 2 presents information on minimum number of individuals (MNI) and bone weight (BW; in grammes) 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

Table 2: The ichthyofaunas of Abu Darbein (AD), EL DAMER (ED) and Aneibis (AN) - Fragment counts.

Fish families/Sites		AD	ED	AN
Protopteridae:	*Protopterus aethiopicus*	4	46	50
Polypteridae:	*Polypterus* sp.	12	53	53
Osteoglossidae:	*Heterotis niloticus*	-	-	1
Mormyridae:	*Hyperopisus bebe*	-	5	2
	Mormyrops anguilloides	1	-	4
	indet.	41	140	38
Gymnarchidae:	*Gymnarchus niloticus*	-	37	6
Characidae:	*Hydrocynus sp.*	1	3	-
	Alestes sp.	3	54	-
	indet.	-	13	-
Distichodontidae:	*Distichodus* sp.	3	58	3
Citharinidae:	*Citharinus* sp.	-	6	-
Distichodontidae/Citharinidae	*indet.*	-	5	4
Cyprinidae:	*Labeo* sp.	-	27	2
	Barbus sp.	-	20	6
	indet.	34	333	24
Clariidae:	*Clarias* sp.	11	71	9
	Heterobranchus sp.	-	1	-
	Clarias/Heterobranchus	74	926	261
Bagridae:	*Bagrus bajad*	4	2	1
	Bagrus docmak	2	2	1
	Bagrus sp.	50	247	48
	Clarotes laticeps	-	4	1
	Auchenoglanis sp.	1	1	-
Mochokidae:	*Synodontis schall*	5	6	13
	Synodontis serratus	-	-	2
	Synodontis sorex	1	2	-
	Synodontis batensoda	1	-	-
	Synodontis membranaceus	3	-	-
	Synodontis sp.	301	261	455
Malapteruridae:	*Malapterurus electricus*	-	1	1
Centropomidae:	*Lates niloticus*	32	217	176
Cichlidae: Tilapiini		3	42	22
Tetraodontidae:	*Tetraodon fahaka*	1	1	3
Identified fish remains		588	2584	1186
Unidentified fish remains		76	648	179
Total number of fish remains		664	3232	1365

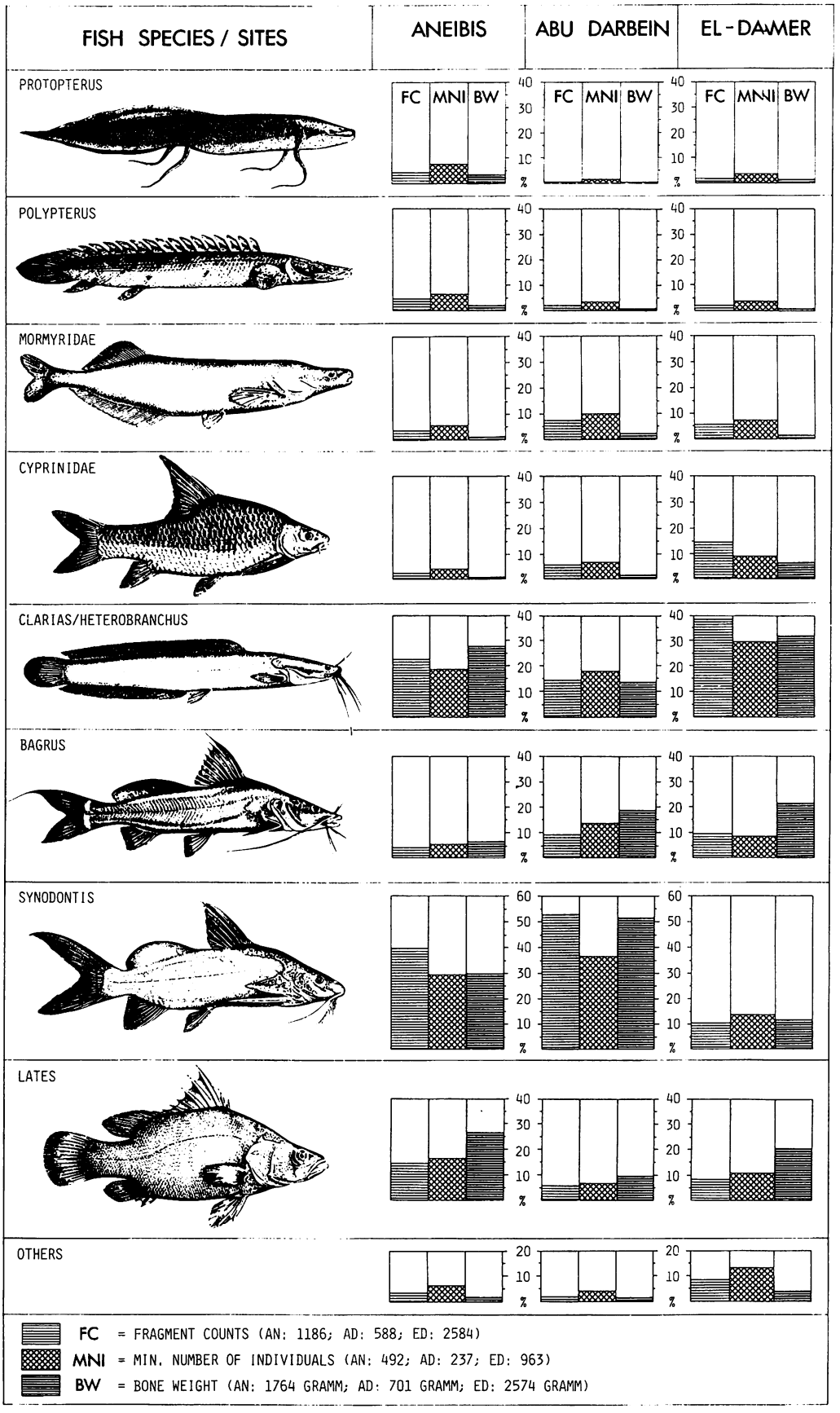

Fig. 2: Relative frequencies of the major fish genera: fragment counts, minimum number of individuals and bone weight. Fish species redrawn after Boulenger (1907).

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. 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 captured, remains of hatchlings and fingerlings (= smallest size class) are rare in the samples. At El Damer immature *Clarias* and *Synodontis* are proportionally more frequent than at Aneibis and Abu Darbein.

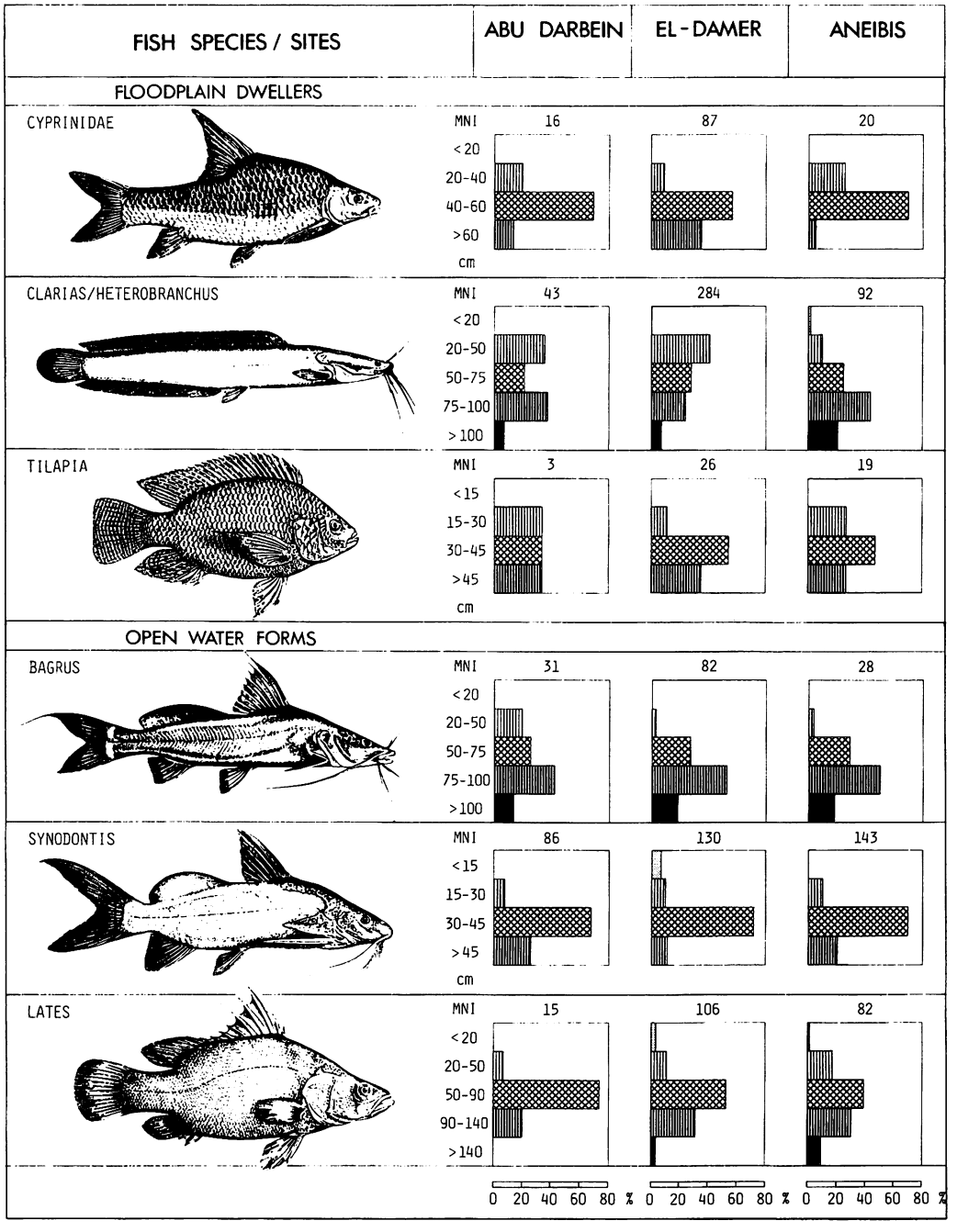

Fig. 3: Size distribution in percent of six major fish genera/families from Abu Darbein, El Damer and Aneibis. Fish species redrawn after Boulenger (1907).

Very large *Lates* (> 140) are only found in the younger sites of El Damer and Aneibis.

3. Season and place of capture of the fish

In many fluviatile systems in Africa traditional fishing 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 ot this cycle, many fish species undertake lateral migrations into these shallow flooded areas to feed and spawn, both adults and newborns benefitting 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 fishing is when the waters are receding and at low waters in the dry season (e.g. Boulenger 1901: XXV; Brelsford 1946: 43; Sundström 1972: 17; Stewart 1989: 70, with references).

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 capture migrating Mormyrids, *Alestes, Barbus, Labeo, Clarias,* tilapias etc. (cf. Gautier and Van Neer 1989; Stewart 1989: 92, 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, 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 captured this way include *Protopterus, Polypterus, Heterotis, Labeo, Barbus, Clarias, Synodontis,* tilapias and occasionally *Lates* (Molloy 1956: 58–59). For many traditional fishing methods the involvement of large parties of women and children is necessary to obtain good results (e.g. Bloss 1945; Stubbs 1949).

As said, fish such as *Clarias, Barbus, Labeo* and tilapias 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, i.e. channels. However, newborns and juveniles of these species are known to frequent the backwaters for some part of the year (Gautier and Van Neer 1989: 141, with references). When the waters recede, adult fish migrate back towards the main waterbody before the juveniles (Reizer 1971: 83 *fide* Gautier and Van Neer 1989: 144).

For the Central Sudanese Nile valley Clark (1989) recently postulated that Mesolithic fishing must have been an important dry season activity, taking 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 fishing clearly went beyond the opportunistic level suggested by Clark.

Judging from the composition of the ichthyofaunas (Table 2, 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 points 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 captured 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. Moreorer, 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 fishing in present-day sub-Saharan Africa.

If the ratio floodplain dwellers[1] (*Clarias,* tilapias, Cyprinids) to open water forms (*Synodontis, Bagrus, Lates*) in the samples is considered, it can be seen that the fishing activities of the Abu Darbein inhabitants focused on the Atbara river, whereas at El Damer emphasis was laid on foodplain fishing. This is in agreement with the extent of the alluvial plain near the two sites: narrow at Abu Darbein, wide at El Damer. At Aneibis there is a 2 km wide floodplain between the site and the Nile, yet about 60% of the fish taken are open water forms. Moreover, large to very large fish,

in particular Nile perch, were more frequently captured than in earlier times. It can be argued that Aneibis represents some kind of dry season (fishing), camp, but its distance from the Nile makes this unlikely: traditionally temporary dry season fishing camps are located very close to the edge of the river (e.g. Sundström 1972: 40). Perhaps the Aneibis ichthyofauna reflects a shift from a primarily floodplain-oriented towards a more river-oriented fishing strategy, the river being less unpredictable as a source of fish than the alluvial plain. In this respect it should be mentioned that archaeological research in Central Sudan has demonstrated that the Mesolithic hunter-gatherers were acquainted with a diversified set of pottery, including vessels which are hardly transportable because of their size (e.g. Arkell 1949, Caneva 1983). Since pots do generally suggest a decrease in mobility of the human groups using them, it has been postulated that the Khartoum Mesolithic people developed a more sedentary way of life, which may have resulted in an increase in population density (e.g. Caneva 1983, Haaland 1992). To cover its protein demands, the growing hunter-gatherer population may not only have relied more heavily upon the available biological resources, but may also have developed additional ways of exploiting them. Conceivably, the ichthyofauna of Aneibis can be interpreted in terms of such a development. In addition, we observed that the terrestrial mammalian fauna from Aneibis differs as well from the other Khartoum Mesolithic assemblages studied so far. In general, these are dominated by bovid species frequenting riverine grasslands and gallery forests, i.e. oribi, bohor reedbuck, kob and topi (e.g. Bate 1949; Gautier 1983; Peters 1986, 1989). At Aneibis, however, many mammalian remains are derived from big game animals such as hippopotamus and African buffalo, small to large antelopes being less important as meat suppliers. Perhaps changed hunting behaviour can be invoked to explain this shift. On present evidence, we assume that the changes in fishing and hunting behaviour reflect an increased protein demand, that might be related to the ongoing process of sedentarisation in the Central Nile vallay.

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, fishing on the flooplain 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 barbed bone points, 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. Barbed bone points 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 1992) 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 confluence of the Nile and the Atbara (cf. Pekkola 1918).

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 (ca. 8600–8300 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 (ca. 8050–7800 BP) and Aneibis (ca. 7900–7600 BP), Nile perch with a total length up to 2 m are recorded, 30 to 40% of the perch surpassing 90 cm TL. Since we cannot imagine how this could have been accomplished by Mesolithic fishermen 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 insights 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 practises 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 (i.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).

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Note

[1] The terms "Floodplain dwellers" and "Open water forms" have recently been proposed by Van Neer (1989) to separate fish species with a prolonged stay on the alluvial plain from those that frequent the alluvial plain for a short period of the year, or do not enter it at all.

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