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LATE PLEISTOCENE HUNTER-GATHERERS AT ISHANGO (EASTERN ZAIRE) : THE FAUNAL EVIDENCE

by

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Archaeozoology, hunter-gatherers, Late Pleistocene, Zaire, palaeoecology.

MOTS CLES

Archéozoologie, chasseurs-cueilleurs, Pleistocène Supérieur, Zaïre, paléoécologie.

ABSTRACT

A new examination of the faunal remains collected at the prehistoric site of Ishango has shown that three stages can be distinguished. The first one refers to a Late Pleistocene hunter-fisher-gatherer community adapted to relatively dry and open savanna living conditions. The second stage may relate to a period of volcanic activity and wetter climatic conditions in the study area, but without evidence of a human occupation at Ishango. The third stage is again characterised by the presence of a human population, adapted to savanna living conditions.

RESUME

Les chasseurs-cueilleurs du Pleistocène final d'Ishango (Est-Zaïre) : les données de la faune. - Un nouvel examen des restes d'animaux, recueillis sur le site préhistorique d'Ishango, nous a montré la présence de trois stades principaux. Le premier stade nous montre qu'une communauté de chasseurs-pêcheurs-cueilleurs, adaptée aux conditions de vie relativement sèches de la savane ouverte, y a survécu durant le Pleistocène Supérieur. Le second stade dans la région en question peut avoir été sous l'influence d'activités volcaniques et de conditions climatiques plus humides mais sans évidence d'occupation humaine à Ishango. Le troisième stade est caractérisé par des traces de population humaine, également adaptée aux conditions d'existence en savane.

I. INTRODUCTION

Several authors have proposed that the development of prehistoric fishing adaptations in many parts of Africa represents a significant change in human relationship to the environment; it would indicate a shift to a more sedentary way of life (cf. BROOKS & SMITH, 1987). While the earliest sites with such fishing adaptations, characterised by harpoons, appear to be located around Lakes Turkana, Nakuru, and Rutanzige (ex-Edward), bone harpoons have also been found as far west as the Aouker Massif in Mauretania and as far north as Naqada in Egypt, although the latter are clearly later in date and distinctive in style (de HEINZELIN, 1962). SUTTON (1977) assumes that an "aquatic civilisation" spread across large parts of Africa during the Early Holocene, achieving its zenith in the seventh millennium BC. This adaptation would correspond to the wetter climatic conditions prevailing during this period.

The site of Ishango, located on the steep cliffs forming the right bank of the Semliki river where it exits from Lake Rutanzige (cf. Figs 1 & 2), is of special importance in this context. Nearly sixty years ago, explorers came across a number of bone harpoon points scattered along the bottom of these cliffs. A decade later, a small scale excavation was carried out at Ishango by the Belgian biologist H. DAMAS (DAMAS, 1940). Apart from some artefacts and a few faunal remains, two fragmentary human mandibles were also recovered. One of these is according to de HEINZELIN (1957 : 14) referable to a late "mesolithic" industry with microliths, or to an intrusive Iron Age skeleton. The second jaw, from 180 to 200 cm below the surface, was associated with some bones of large mammals and with bone harpoons with two rows of barbs.

No further archaeological investigations were carried out until in 1950 de HEINZELIN was put in charge of a mission to the Upper Semliki area. His work resulted in a number of monographs concerned with the geology, palaeontology and archaeology of the study area (de HEINZELIN, 1955, 1957, 1962). The excavation of two trenches near the testpit made by DAMAS enabled de HEINZELIN (1955 : 63-66, 1957 : 6-14, Fig. 3) to distinguish a series of archaeological levels as follows (see also BROOKS & SMITH, 1987) :

- 13.40 m above lake level (= 911.85 m above sea level) : surface; black volcanic soil with abundant potsherds, fragments of grinding equipment and iron objects. This level is related to a Bantu group living in the area before it became a national park. Among the few bone fragments collected in this level we recognised a first phalanx of cattle.
- 13.40 to 13.10 m : artificial platform of volcanic ash relating to recent occupation.
- 13.10 to 12.50 m : black soil with charcoal, worked quartz and Iron Age pottery.
- 12.50 to 12.00 m : brown horizon ("Zone brun"), resting on indurated lake deposits from the last high lake level. The "Zone postérieure à l'émersion définitive de la terrasse (= Z.POST-EM.), found at the base of this horizon, yields abundant non-microlithic quartz, faunal remains, mortars and pestles, a few human remains, but no pottery.
- 12.00 to 10.50 m : "niveaux tufacés (= N. TUF.)" consisting of cemented banks of sand, gravel and shell, and containing a non-microlithic quartz industry, fragments of grinding stones, faunal remains and harpoons with one row of barbs. This level represents the third or youngest stage of the Ishango culture, i.e. Ishango C.
- 10.50 m : "niveau fossilifère principal (= N.F.PR.)", with a dense accumulation of shells and bones, including fragmentary human remains, mixed with grinding equipment and lithics. This second stage of the Ishango culture, or Ishango B, is characterised by bone harpoons with two rows of barbs.
- 10.50 to 9.50 or 9.00 m : "gravier inférieur (= G.INF.)" or first stage of the Ishango civilisation, i.e. Ishango A. This level consists of rolled gravel with fossils, derived from older deposits, and a more or less rolled industry in quartz and quartzite. In this level, a few biserially barbed harpoons are present, be it that they have more barbs than the harpoons found in the N.F.PR deposits.

In the context of the supposed "aquatic civilisation", the special importance of the Ishango site lies in the fact that here two levels with biserially barbed harpoons underlie a level with uniserially barbed harpoons, the latter dominating at other prehistoric sites in Africa (BROOKS & SMITH, 1987). Another major difference between these sites and Ishango is the presence of pottery in association with the harpoon horizons in East Africa. These facts have been interpreted by de HEINZELIN (1962) and others (SUTTON, 1977) as indicative of an earlier age for the Ishango fishing culture. Unfortunately, the age of the Ishango civilisation could not be established very precisely. However, on the basis of the best geological, palaeontological and archaeological evidence, de HEINZELIN (1962) concluded that the age of the Ishango culture would be about 9000 to 7000 BP.

The excavations at Ishango produced a relatively large collection of animal remains. Sampling was done by handpicking, and because much of the bone material was coated with a coarse matrix, it can be expected that a number of specimens were overlooked. Therefore, sampling bias against some smaller items may have occurred. The faunal remains, once in Belgium, were separated into five categories and identified by several specialists : the molluscs by ADAM (1957), the fish by GREENWOOD (1959), the birds by VERHEYEN (1959), the mammals by HOPWOOD & MISONNE (1959) and the human remains by TWIESSLMANN (1958). The birds and mammals received little attention; also, generally speaking, the approach of the faunal studies was purely palaeontological and the various archaeozoological aspects (cf. GAUTIER, 1983a; GAUTIER & VAN NEER, 1989) received little attention. Therefore we were invited to restudy the mammals and present an updated evaluation of the Ishango faunal material from the archaeozoological point of view. The following report then deals with the fauna from the aceramic layers as described above. As can be seen in Table 1, the bulk of the bone material has been collected in the N.F.PR. and

Fig. 1 : Location of Ishango in Africa.

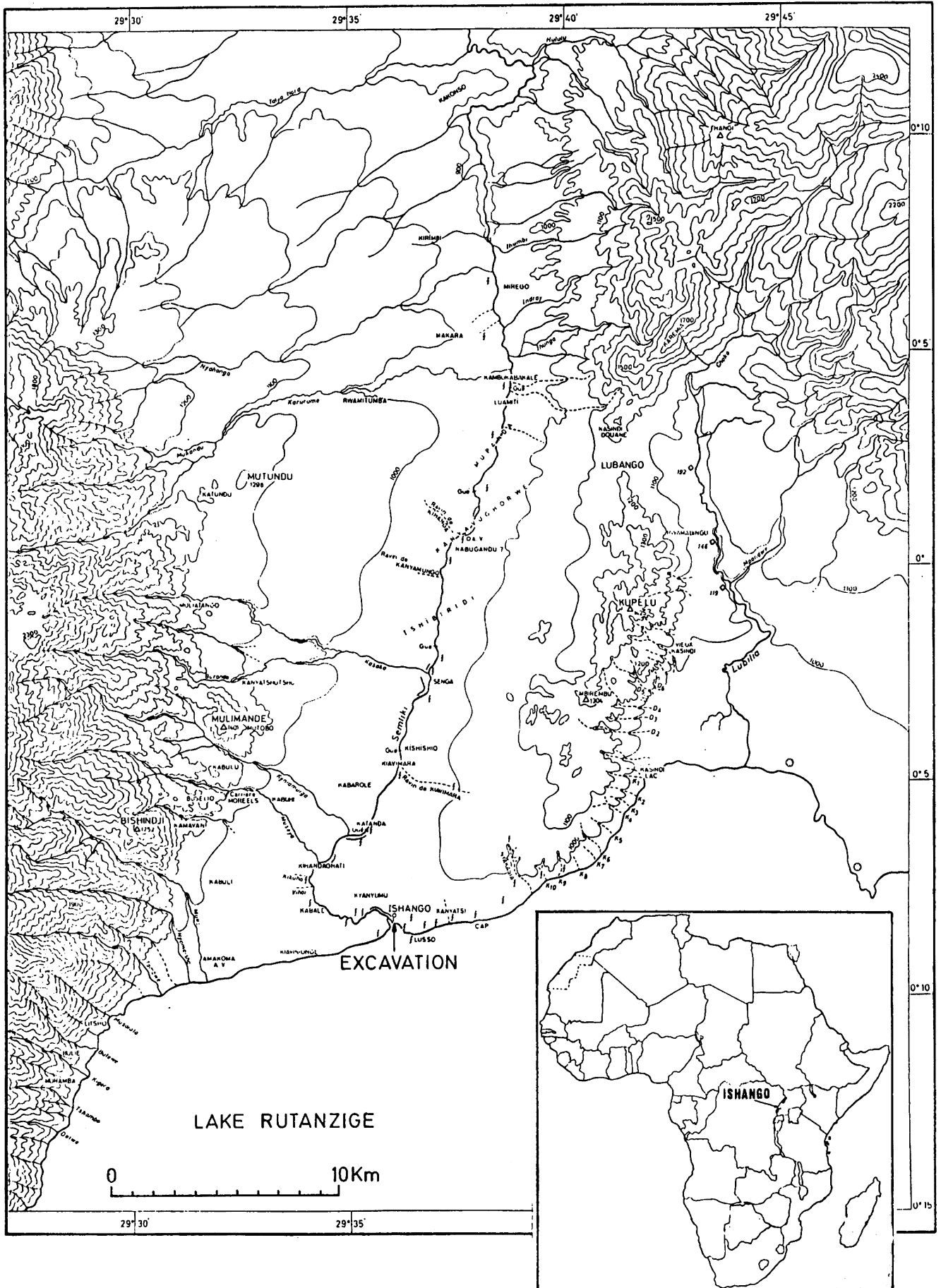
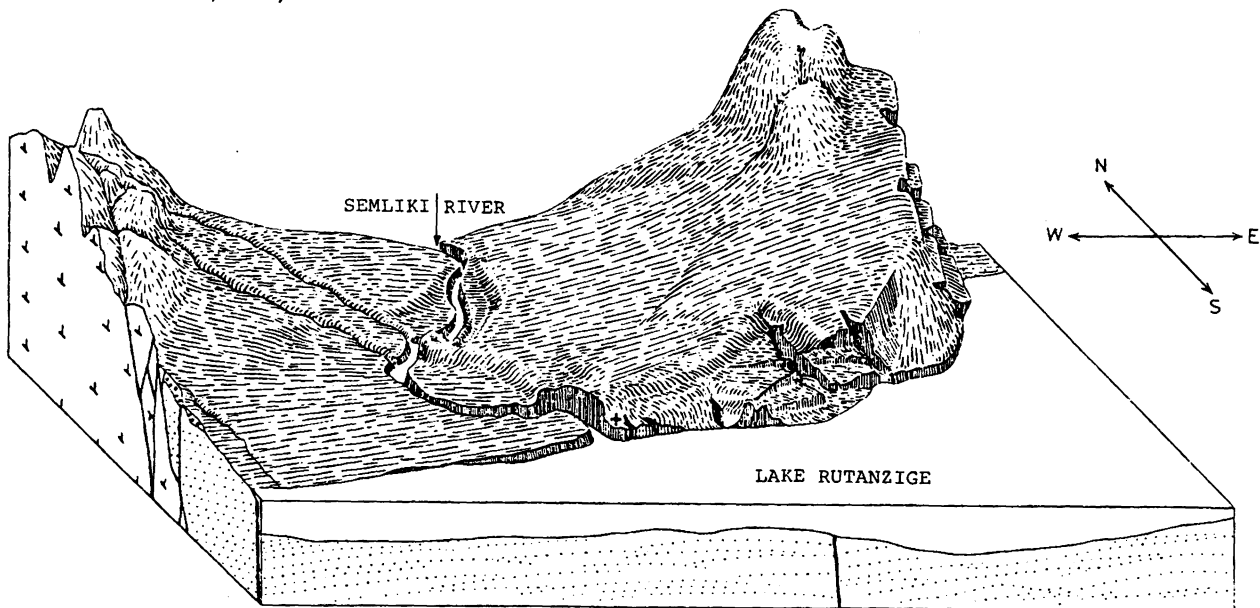


Fig. 2: Blockdiagram showing the Ishango site (+) in its general setting (heights exaggerated 20 times; after de HEINZELIN, 1957).



Z.POST-EM. deposits. Consequently our analysis and interpretation focuses on these two assemblages. In the following, we will use the terms younger deposits or younger assemblage to refer to the Z.POST-EM. faunal sample, while the terms older deposits, older assemblage, Ishango culture, Ishangian levels or Ishangian horizons refer to the N.F.PR. and N.TUF. levels. We did not reconsider the human remains here, because they are of no relevancy to this study. Additional excavations were carried out at Ishango in 1985 by the Semliki Research expedition. New materials to be used in a series of dating procedures as well as

faunal remains were recovered. Preliminary results were published by BROOKS & SMITH (1987), but the paper does not provide information about the faunal material.

2. DESCRIPTION OF THE FAUNAL REMAINS

2.1. Molluscs

The molluscan assemblage consists of land- and freshwater snails and freshwater bivalves. This material has been analysed and described by ADAM (1957). A list of species, taxonomically updated on the basis of

Table 1: The Ishango vertebrate remains as available for restudy in the Koninklijk Belgisch Instituut voor Natuurwetenschappen.

Stratigraphical level	G. INF.		N.F.PR.		N.TUF.		Z.POST-EM.		TOTALS
	n	%	n	%	n	%	n	%	
Vertebrate group									
Fish	81	97.6	5 842	81.9	-	-	758	54.1	6 676
Reptiles	-	-	4	0.1	-	-	9	0.7	13
Birds	-	-	44	0.6	-	-	6	0.4	50
Mammals	2	2.4	1 241	17.4	80	100.0	628	44.8	1 951
Total number of identified remains	83	100.0	7 131	100.0	80	100.0	1 401	100.0	8 690
Approximate number of unidentified vertebrate remains (ca. 90% mammals)	±20		±7 000		±200		±2 400		±9 600
Total number of vertebrate remains	±100		±14 000		±300		±3 800		±18 200

Fig. 3 : Excavation scheme and stratigraphical levels at Ishango (after de HEINZELIN, 1957).

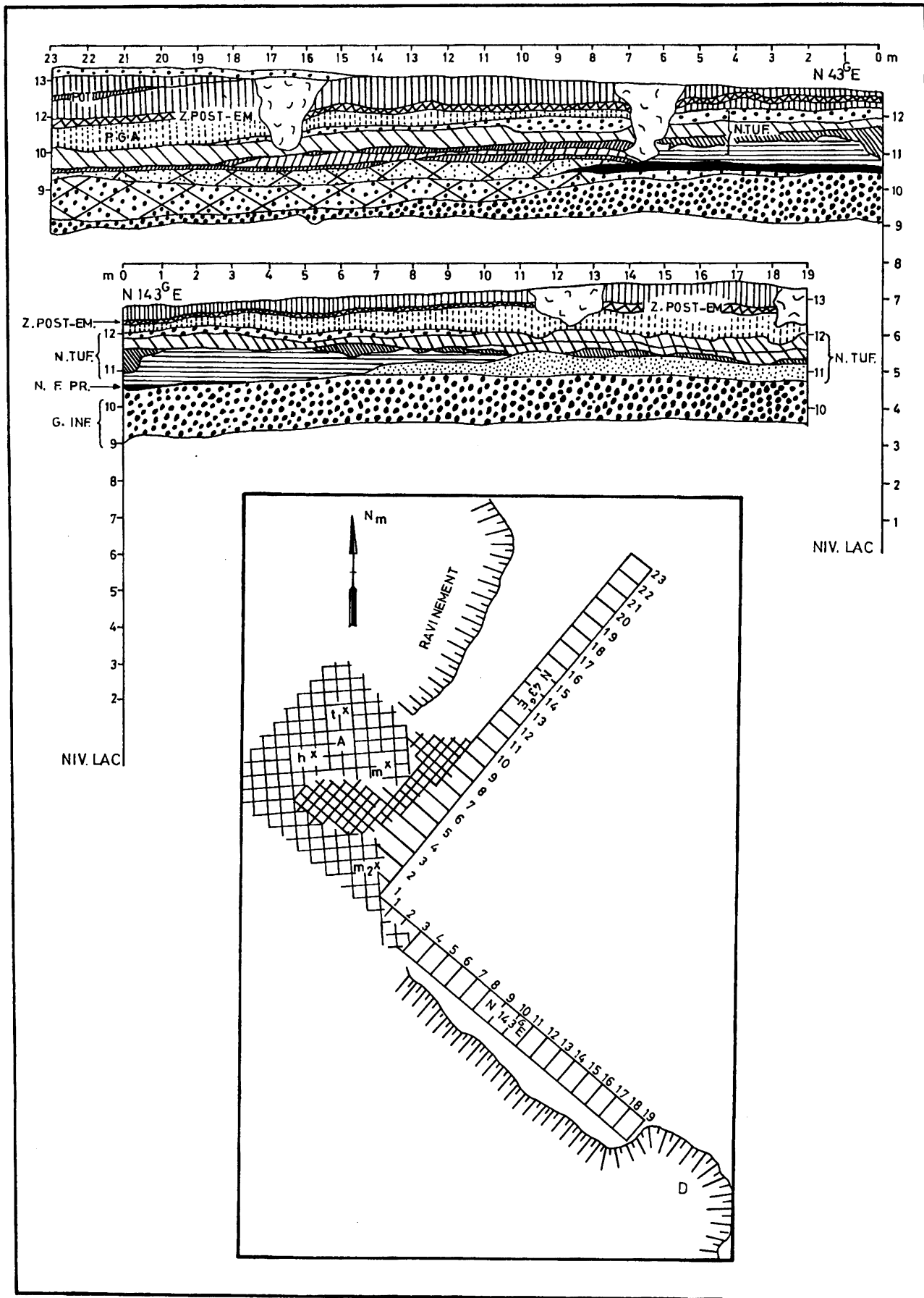


Table 2: Taxonomically updated list of the Ishango molluscs.

The symbols used are RR = very rare, R = rare, F = frequent and FF = very frequent.

Stratigraphical level	N.F.PR.	N.TUF.
Molluscan groups and species		
Freshwater snails		
<i>Bellamya unicolor</i>	F	F
<i>Pila ovata</i>	R	F
<i>Gabbiella humerosa</i>	F	F
<i>Gabbiella senariensis</i>	R	R
<i>Melanoides tuberculata</i>	F	FF
<i>Cleopatra bulimoides</i>	RR-R	FF
<i>Lymnaea natalensis</i>	-	RR
<i>Burnupia ?edwardiana</i>	R	RR
<i>Ceratophallus kigeziensis</i>	F	F
<i>Ceratophallus bicarinatus</i>	-	RR
<i>Ceratophallus apertus</i>	RR	RR
<i>Ceratophallus faini</i>	R	F
<i>Gyraulus costulatus</i>	RR	RR
<i>Biomphalaria choanophala</i>	R	F
<i>Biomphalaria sudanica</i>	-	R
<i>Bulinus truncatus</i>	-	R
Land snails		
<i>Achatina stuhlmanni</i>	RR	-
<i>Limicolaria martensiana</i>	R	-
<i>Curvella</i> sp.	RR	-
<i>Succinea ?baumanni</i>	RR	R
Freshwater bivalves		
<i>Caelatura bakeri</i>	R-F	R
<i>Caelatura acuminata</i>	R	RR
<i>Aspatharia rubens</i>	RR	-
<i>Mutela ?nilotica</i>	RR-R	-
<i>Etheria elliptica</i>	RR	-
<i>Corbicula consobrina</i>	R	F
<i>Sphaerium hartmanni</i>	RR	-
<i>Pisidium</i> cf. <i>victoriae</i>	R	RR

VAN DAMME & GAUTIER (1970), BROWN (1980) and VAN DAMME (1984) is given in Table 2. Mollusc finds are limited to the N.F.PR. and N.TUF. deposits, except for some *Limicolaria* shell fragments found in the Z.POST-EM. sediments (de HEINZELIN, 1955 : 66).

The shell debris of freshwater snails mostly pertains to genera and species which are widely distributed throughout Africa such as *Bellamya*, *Pila*, *Gabbiella* etc. On the other hand, *Ceratophallus apertus*, *C. faini* and *Burnupia ? edwardiana* had a much more limited distribution. They are only recorded from the Ishangian levels, and it is not excluded that these forms also lack in the present-day fauna of the lake. Most of the species found at Ishango are inhabitants of larger permanent

waters, with a few species also frequenting marshy areas or temporary waterbodies (*Pila ovata*, *Bulinus truncatus*).

Shells of land snails are not frequent at Ishango. They pertain to four common African genera : *Limicolaria*, *Curvella*, *Succinea*, and *Achatina*. According to ADAM (1957 : 109) the *Achatina* shell appears to be identical with *A. stuhlmanni*, a species described by PILSBRY (1919 : 79) from the northeast Zairean rainforest. This identification must be verified because today several *Achatina* species occur in the Ishango area.

The Ishango deposits also yielded a considerable number of valves and fragments of freshwater bivalves. These pertain mainly to genera which are widely distributed in Africa. It may be noted that in his recent work on North African freshwater molluscs, VAN DAMME (1984 : 57) considers *Caelatura bakeri* and *C. acuminata* lacustrine forms of *C. aegyptiaca*. All bivalves found at Ishango are inhabitants of larger waterbodies.

2.2. Fish

As can be seen in Table 1, fish bones form a major component of the identified remains. They are limited to three stratigraphical units (Table 1). The fragment counts, listed in Table 3, are based on our interpretation of the inventories published by GREENWOOD (1959). We summarize the faunal data below. Some information concerning the present-day distribution of the species involved has been gleaned from BOULENGER (1907), WORTHINGTON (1929) and GREENWOOD (1955-57).

Polypterus is represented by an almost entire abdominal vertebra. Three species occur in the present-day Nile system, namely *P. senegalus*, *P. bichir* and *P. endlicheri*. Today, *Polypterus* is absent from the lake and the Semliki. According to GREENWOOD (1959 : 54), the bones compare more closely with the corresponding vertebrae of *P. senegalus*.

Lungfish, most likely *Protopterus aethiopicus*, are represented exclusively by toothplates. Other skeletal elements of this species are only exceptionally found in archaeological samples because of their poor preservation chances (RIVALLAIN & VAN NEER, 1983, 1984).

Cyprinid remains are abundant in the older deposits, but less frequent in the younger ones (Table 3). GREENWOOD (*ibid.*) recognised two *Barbus* species on the basis of morphological differences in pharyngeal teeth and bones, namely *Barbus bynni* and *B. altianalis*. Most of the identifiable fragments pertain to *B. bynni*, and GREENWOOD therefore assumes that this was the dominant species during earlier times. Today, *B. altianalis* still occurs in the lake, but *B. bynni* has never been recorded alive (GREENWOOD, 1955-57).

Clariid catfishes are well represented in the Ishango samples. On the basis of the ornamentation of the neurocranial bones, GREENWOOD distinguished two genera : *Clarias* and *Heterobranchus*. The *Clarias* remains would resemble closely *C. lazera* and *C. mossambica*, two species which TEUGELS (1982) considers to be conspecific with *C. gariepinus*.

Table 3 : Absolute and relative frequencies of the Ishango fish bones as identified by GREENWOOD (1959)

Stratigraphical level	G. INF.		N.F. PR.		Z. POST-EM.	
	n	%	n	%	n	%
Fish orders and genera (1)						
Polypteriformes : <u>Polypterus</u> sp., probably <u>P. senegalus</u>	-	-	1	+	-	-
Dipnoi : <u>Protopterus aethiopicus</u>	9	11.1	26	0.4	1	0.1
Cypriniformes : <u>Barbus bynni</u>	-	-	826	14.1	-	-
<u>Barbus altianalis</u>	-	-	24	0.4	-	-
<u>Barbus</u> sp., mainly <u>B. bynni</u>	2	2.5	1 679	28.8	47	6.2
Total Cypriniformes	2	2.5	2 529	43.3	47	6.2
Siluriformes : <u>Clarias</u> sp., most likely <u>C. gariepinus</u>	14	17.3	882	15.1	165	21.7
? <u>Heterobranchus</u> sp.	-	-	18	0.3	-	-
<u>Bagrus</u> sp., probably <u>B. docmac</u>	-	-	-	-	378	49.9
<u>Clarotes</u> sp.	9	11.1	-	-	-	-
<u>Synodontis schall</u>	-	-	3	+	-	-
<u>Synodontis frontosus</u>	1	1.2	427	7.4	11	1.5
<u>Synodontis</u> sp., mainly <u>S. frontosus</u>	12	14.8	449	7.7	4	0.5
Siluriformes <u>indet.</u>	5	6.2	-	-	8	1.1
Total Siluriformes	41	50.6	1 779	30.5	566	74.7
Perciformes : <u>Lates niloticus</u>	18	29.2	649	11.1	8(2)	1.1
Tilapiini	11	13.6	828	14.2	136	17.9
Perciformes <u>indet.</u>	-	-	30	0.5	-	-
Total Perciformes	29	35.8	1 507	25.8	144	19.0
Total number of fish bones	81	100.0	5 842	100.0	758	100.0

(1) Based on the figures, given in GREENWOOD (1959).

(2) According to GREENWOOD (*ibid.*, 1959:73), the Lates specimens are more heavily mineralized than are the other specimens from this deposit and may therefore be derived from an earlier stratum.

The presence of Bagrid catfishes is limited to the G. INF. and the Z. POST-EM. deposits. The genus Clarotes has been recognised in the first assemblage, while the genus Bagrus is restricted to, though abundant in the second assemblage. The Bagrus remains have not been assigned specifically, but most likely we are dealing with B. docmac which is present today in Lake Rutanzige and in the Semliki (GREENWOOD, 1955-57; PERCY & RIDLEY, 1955).

Synodontis remains are frequently found in the Ishango deposits (Table 3). On the basis of certain morphological characteristics, GREENWOOD concluded that most of the specimens would be referable to S. frontosus; only a few bones would be derived from S. schall.

The Nile perch (Lates niloticus) is represented by numerous elements in the N.F.PR. assemblage. The few Nile perch specimens, described from the younger level, are more heavily mineralised than are other specimens from this stratum (GREENWOOD, 1959 : 73). Most likely they are derived from the N.F.PR. deposits and have been mislaid during the excavation. We nevertheless decided to list them among the Z.POST-EM. remains, because this was also done by GREENWOOD.

Cichlid remains are quite abundant in all levels at Ishango (Table 3). They are derived from tilapias, but no

specific identification could be given.

Some fish bones could not be assigned with certainty to one of the previous groups. They are lumped in two categories : Siluriformes indet. and Perciformes indet.

Within the mammalian bone sample from the Z.POST-EM. deposits submitted for study, we recognised ten skull roof fragments of Clarias. These specimens were added to the counts given by GREENWOOD.

2.3. Reptiles

Remains of reptiles are confined to the major assemblages and referable to monitor and one or more snake species. Monitor were recognised on the basis of their typical vertebrae. Only one monitor species frequents Lake Rutanzige today, namely the Nile monitor (Varanus niloticus). This, combined with the fact that the fossil vertebrae are derived from large monitors suggests that we are dealing with V. niloticus instead of V. exanthematicus, the smaller Cape monitor.

As to the snake remains, a few vertebrae of different sizes were encountered. They cannot be assigned specifically due to the lack of comparative collections.

2.4. Birds

In his preliminary report on the bird remains from Ishango, VERHEYEN (1959) noted the presence of at least eight species including common cormorant, pink-backed pelican, saddle bill stork, marabou stork and African river eagle. While analysing the mammalian collection we found an additional twenty bird bones. As we did not have sufficient comparative material of African birds at our disposition, the entire avian sample was sent to Dr. D. MATTHIESEN (Gainesville, U.S.A.) for restudy. Her results are summarised in Table 4. On the basis of this list, the actual distribution patterns and the ecological requirements of the birds involved (see, among others, CAVE & MACDONALD, 1955; ETCHECOPAR & HUE, 1967; SERLE *et al.*, 1977, BROWN *et al.*, 1982), it can be concluded that most species present in the bone samples are widely distributed throughout sub-Saharan Africa, frequenting large rivers, lagoons and lakes. Many of them breed in colonies, usually in high trees, and often in company of other species. This is the case for pelicans, storks, cormorants, darters, ibises and herons. Other species prefer also inaccessible trees along watercourses for their nests but remain solitary, for example the African fish eagle, *Haliaeetus vocifer* and Verreaux's eagle owl, *Bubo lacteus*.

A small amount of avian remains is derived from "terrestrial" birds such as the scaly or handsome francolin, *F. squamatus*/*F. nobilis*, the white-necked raven, *Corvus albicollis* and a vulture. Ostriches are represented only by egg fragments.

Table 4 : Updated list of the avian remains collected at Ishango.

Stratigraphical level	N.F.PR.	Z.POST-EM.
Bird species and/or group		
Ostrich (<i>Struthio camelus</i>)(1)	+	+
Pink-backed pelican (<i>Pelecanus rufescens</i>)	2	-
Common cormorant (<i>Phalacrocorax carbo</i>)	1	-
Long-tailed shag (<i>Phalacrocorax africanus</i>)	1	-
African darter (<i>Anhinga melanogaster</i>)	3	-
Great (white) egret (<i>Egretta alba</i>)	1	-
Yellow-billed stork (<i>Mycteria ibis</i>)	3+2?	-
African open-bill stork (<i>Anastomus lamelligerus</i>)	1+2?	-
Saddle-bill stork or marabou stork (Leptoptilinae <i>indet.</i>)	1	-
Unidentified storks (Ciconiidae <i>indet.</i>)	3	-
Lesser flamingo (<i>Phoeniconotus minor</i>)	3+1?	-
Spur-winged goose (<i>Plectropterus gambensis</i>)	5	-
Duck (<i>Anas</i> sp.)	1	-
African fish eagle (<i>Haliaeetus vocifer</i>)	1	-
Buzzard-like bird (Buteoninae <i>indet.</i>)	1	-
Vulture (Aegypinae <i>indet.</i>)	2	-
Bird of prey (Accipitridae <i>indet.</i>)	5	1
Scaly or handsome francolin (<i>F. squamatus</i> or <i>F. nobilis</i>)	1	-
Whimbrel (<i>Numenius phaeopus</i>)	1	-
Lesser black-backed gull (<i>Larus fuscus</i>)	-	1
Grey-headed gull (<i>Larus cirrhocephalus</i>)	-	1?
Caspien tern (<i>Hydroprogne caspia</i>)	-	1
Verreaux's eagle owl (<i>Bubo lacteus</i>)	-	2?
African white-necked raven (<i>Corvus albicollis</i>)	3	-
Total number of identified avian bone fragments	44	6

(1) Ostriches are only represented by egg shell fragments.

Some bird remains found at Ishango may have pertained to non-breeding migrants from Europe. In this category of birds, which occur commonly of Africa from October to March, we may include the whimbrel, *Numenius phaeopus*, and the lesser black-backed gull, *Larus fuscus*.

2.5. Mammals

A large amount of the vertebrate samples consists of mammalian bone fragments. In their preliminary report, HOPWOOD & MISONNE (1959) discussed briefly these finds as well as the specimens collected by DAMAS in 1935 from his testpit. We summarise their results in Table 5.

The following contains a re-analysis of the Ishango samples as available in the Koninklijk Belgisch Instituut voor Natuurwetenschappen in Brussels. However, we noted that some typical specimens listed by HOPWOOD & MISONNE (*ibid.*) are lacking in the collections, for example the *Lycaon pictus* remains from the N.TUF. deposits, while others have apparently been mislaid, such as the *Alcelaphus* horn core and some of the *Lutra* remains (cf. Table 5 versus 6). Table 6 summarizes the absolute frequencies of the mammalian species and groups, present in the main stratigraphical units. Tables 7a, 7b, 8a and 8b show the intraskeletal distribution of the mammals found in the N.F.PR. and Z.POST-EM. deposits.

The identification of the fossil specimens is based upon direct comparison with the extensive osteological collections of the institute already mentioned, the Koninklijk Museum voor Midden-Afrika (Tervuren) and the Laboratorium voor Paleontologie (Gent), and upon osteomorphological and osteometrical data published by

Table 5 : The mammalian assemblage of Ishango as described by HOPWOOD & MISONNE (1959).

Stratigraphical level	G-INF.	N.F.PR.	N.TUF.	Z.POST-EM.
Mammalian species (1)				
<i>Lepus</i> cf. <i>victoriae</i>	-	R	-	-
<i>Thryonomys awinderianus</i>	-	R	-	-
<i>Hystrix</i> sp.	-	-	-	RR
<i>Lutra maculicollis</i>	RR	RR	-	-
<i>Lycaon pictus</i>	-	-	R(2)	-
<i>Panthera pardus</i>	-	-	-	RR
<i>Dendrohyrax</i> sp.	-	-	-	RR
<i>Phacochoerus aethiopicus</i>	RR	RR	R	F
<i>Potamochoerus porcus</i>	-	R	-	-
<i>Hippopotamus amphibius</i>	R	FF	FF	FF
<i>Cephalophus</i> sp.	-	F	-	F
<i>Tragelaphus acriptus</i>	-	R	-	F
<i>Redunca redunca</i>	-	R	R	F
<i>Damaliscus lunatus</i>	-	FF	FF	FF
<i>Alcelaphus leivell</i>	RR	-	-	-
<i>Kobus defassa</i>	?RR	-	-	-
<i>Syncerus nanus</i>	-	F	R	FF
<i>Syncerus caffer</i>	-	FF	R	F
<i>Colobus</i> sp.	-	-	-	RR

(1) The symbols used are RR=very rare, R=rare, F=frequent and FF=very frequent.

(2) This specimen was found by DAMAS in 1935-36 in a testpit.

Table 6 : Updated list of the mammals collected in the major levels.

Stratigraphical level	N.F.PR.	N.TUF.	Z.POST -EM.	TOTALS
Mammalian species and/or groups				
PRIMATES				
Medium sized monkey (<u>Cercopithecus/Colobus</u>)	3	-	2	5
LAGOMORPHA				
Hare (<u>Lepus/Poelagus</u>)	26	-	-	26
RODENTIA				
Marsh cane rat (<u>Thryonomys swinderianus</u>)	19	-	3	22
Porcupine (<u>Hystrix</u> sp.)	-	-	1	1
Cane rat or porcupine (<u>Thryonomys/Hystrix</u>)	-	-	1	1
CARNIVORA				
Jackal (<u>Canis</u> sp.)	2	-	-	2
Cape hunting dog (<u>Lycaon pictus</u>)	-	-	1	1
Spotted-necked otter (<u>Lutra maculicollis</u>)	6	-	-	6
Clawless otter (<u>Aonyx</u> sp.)	2	-	-	2
Medium felid (<u>Felis</u> sp.)	1	-	-	1
Lion (<u>Panthera leo</u>)	1	-	1	2
Small carnivores	1	-	2	3
Medium carnivore	-	-	1	1
TUBULIDENTATA				
Aardvark (<u>Orycteropus afer</u>)	3	-	-	3
HYRACOIDEA				
Dassie (<u>Dendrohyrax arboreus?</u>)	-	-	1	1
PERISSODACTYLA				
Rhinoceros (<u>Diceros/Ceratotherium</u>)	1	-	1	2
Zebra (<u>Equus burchelli?</u>)	1	-	1	2
ARTIODACTYLA				
Bushpig (<u>Potamochoerus porcus</u>)	3	1	1	5
Warthog (<u>Phacochoerus aethiopicus</u>)	10	3	7	20
Bushpig and/or warthog	17	-	10	27
Giant forest hog (<u>Hylochoerus meinertzhageni</u>)	2	-	-	2
Hippopotamus (<u>Hippopotamus amphibius</u>)	96	40	61	197
Oribi (<u>Ourebia ourebi</u>)	5	-	5	10
Small wild bovids, mainly oribi	52	-	35	87
Bushbuck (<u>Tragelaphus scriptus</u>)	11	-	6	17
Sitatunga (<u>Tragelaphus spekei</u>)	1	-	-	1
Tragelaphine antelopes, mainly bushbuck	4	-	8	12
Bohor reedbuck (<u>Redunca redunca</u>)	26	-	26	52
Kob (<u>Kobus kob</u>)	-	-	5	5
Reduncine antelopes, mainly bohor reedbuck	6	-	8	14
Medium wild bovids	97	1	53	151
Topi (<u>Damaliscus lunatus</u>)	11	2	7	20
Hartebeest (<u>Alcelaphus buselaphus</u>)	-	1	-	1
Alcelaphine antelopes, mainly topi	218	17	93	328
Waterbuck (<u>Kobus ellipsiprymnus</u>)	4	1	2	7
Greater kudu (<u>Tragelaphus strepsiceros</u>)	2	-	-	2
Roan antelope (<u>Hippotragus equinus</u>)	10	-	2	12
Large wild bovids, mainly topi	482	6	219	707
Large wild bovids, other than topi	36	-	18	54
Eland (<u>Taurotragus</u> sp.)	22	-	6	28
African buffalo (<u>Syncerus caffer</u>)	-	-	16	16
Giant buffalo (<u>Pelorovis antiquus</u>)	15	7	-	22
Very large wild bovids	26	-	6	32
Unclassified wild bovids (<u>Bovidae indet.</u>)	19	-	19	38
Total number of identified bone specimens	1241	80	628	1949

Table 7a : Intraskkeletal distribution of the mammals found in the N.F.PR. deposits (part 1).

N. F. PR. SKELETAL ELEMENT	MAMMALIAN SPECIES AND/OR GROUPS																
	Ossa cranii : Proc. corn.	Ossa cranii : others	Ossa faciei : maxilla	Ossa faciei : mandibula	Ossa faciei : others	Dentes superiores	Dentes inferiores	Dentes indet.	Atlas	Axis	Sternum	Scapula	Humerus	Radius	Ulna	Ossa carpi	Ossa metacarpalia
Medium sized monkey (<i>Cercopithecus/Colobus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Hare (<i>Lepus/Poelagus</i>)	-	-	-	1	-	-	-	-	-	-	-	2	5	3	2	-	-
Marsh cane rat (<i>Thryonomys swinderianus</i>)	-	-	3	7	-	2	1	-	-	-	-	-	-	1	1	-	-
Jackal (<i>Canis sp.</i>)	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Spotted-necked otter (<i>Lutra maculicollis</i>)	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Clawless otter (<i>Aonyx sp.</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medium felid (<i>Felis sp.</i>)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Lion (<i>Panthera leo</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small carnivore	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Aardvark (<i>Orycteropus afer</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Rhinoceros (<i>Diceros/Genatotherium</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zebra (<i>Equus burchelli?</i>)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Bushpig (<i>Potamochoerus porcus</i>)	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-
Warthog (<i>Phacochoerus aethiopicus</i>)	1	1	-	3	-	-	3	2	-	-	-	-	-	-	-	-	-
Bushpig and/or warthog	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Giant forest hog (<i>Hylochoerus meinertzhageni</i>)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Hippopotamus (<i>Hippopotamus amphibius</i>)	-	10	2	5	-	-	-	25	1	-	-	5	4	2	-	8	6
Oribi (<i>Ourebia ourebi</i>)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Small wild bovids, mainly oribi	-	-	2	-	-	4	3	-	-	-	-	10	5	5	2	-	1
Bushbuck (<i>Tragelaphus scriptus</i>)	2	-	1	1	-	1	-	-	-	-	-	1	-	-	-	2	1
Sitatunga (<i>Tragelaphus spekei</i>)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Tragelaphine antelopes, mainly bushbuck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Bohor reedbuck (<i>Redunca redunca</i>)	1	-	2	4	-	1	2	-	-	-	-	-	1	2	-	2	1
Reduncine antelopes, mainly bohor reedbuck	-	-	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-
Medium wild bovids	-	1	1	3	-	-	2	-	-	-	-	13	7	5	5	2	2
Topi (<i>Damaliscus lunatus</i>)	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alcelaphine antelopes, mainly topi	3	4	7	24	-	93	87	-	-	-	-	-	-	-	-	-	-
Waterbuck (<i>Kobus ellipsiprymnus</i>)	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	1	-
Greater kudu (<i>Tragelaphus strepsiceros</i>)	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Roan antelope (<i>Hippotragus equinus</i>)	1	-	-	1	-	1	1	-	-	-	-	1	-	-	-	2	-
Large wild bovids, mainly topi	-	-	-	-	-	-	-	7	3	-	-	60	6	27	7	47	19
Large wild bovids, other than topi	-	2	-	1	-	1	2	-	-	1	1	4	1	2	1	-	-
Eland (<i>Taurotragus sp.</i>)	-	1	-	-	2	1	-	-	-	-	-	1	-	2	-	-	1
Giant buffalo (<i>Pelorovis antiquus</i>)	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Very large wild bovids	-	-	-	1	-	1	6	-	-	-	-	3	-	-	-	-	-
Unclassified wild bovids (<i>Bovidae indet.</i>)	6	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-
TOTALS	25	19	19	59	2	110	111	40	8	4	1	109	32	49	19	65	32

several authors : HUE (1907), ROSEVEAR (1969, 1974), PALES & LAMBERT (1971), VAN NEER (1981), WALKER (1985) and PETERS (1986b, 1986c, 1988). Modern biogeographical data of African mammals have sometimes been used to assign fossil specimens specifically or generically. In these particular cases, we have consulted many sources to avoid misidentifications, including KINGDON (1971-1982), MEESTER & SETZER (1971-1977), HALTENORTH & DILLER (1979), and SMITHERS (1983).

Only a restricted number of measurements has been incorporated in the next part. They are taken following von den DRIESCH (1976); a few additional measurements (PETERS, 1986b) have been included. A vertical line behind a column of measurements indicates that they pertain to one specimen.

The Ishango assemblages are dominated by postcranial remains of wild bovids of varying size. Some of these could be assigned generically or specifically on the basis of certain osteomorphological characteristics (see

ARAMBOURG, 1947; GENTRY, 1967; VAN NEER, *ibid.*, and PETERS, *ibid.*). Instead of classifying the remaining bone fragments as "*Bovidae indet.*", we divide them into four size classes, which are to some extent the equivalent of those used by BRAIN (1974), KLEIN (1976, 1977) or VAN NEER (*ibid.*). These size categories are (1) small, including oribi (*Ourebia ourebi*) and bush duiker (*Sylvicapra grimmia*); (2) medium, ranging from bushbuck (*Tragelaphus scriptus*) to kob (*Kobus kob*); (3) large, including topi (*Damaliscus lunatus*) to roan antelope (*Hippotragus equinus*); (4) very large, ranging from eland (*Taurotragus oryx*) to African buffalo (*Syncerus caffer*) etc. (PETERS, 1986a, 1988). The four categories listed above are organised somewhat differently by KLEIN : small bovids or bovid class I (= our small wild bovids), small-medium bovids or bovid class II (= medium sized bovids) and large-medium or bovid class III (= large wild bovids); the two following categories used by KLEIN, large bovids or bovid class IV and very large bovids or bovid class V, correspond

Table 7b : Intraskelatal distribution of the mammals found in the N.F.PR. deposits (part 2).

N. F. PR. SKELETAL ELEMENT														TOTALS	
	Os coxae	Os femoris	Patella	Tibia	Fibula/Os malleolare	Ossa tarsi : Talus	Ossa tarsi : Calcaneus	Ossa tarsi : Others	Ossa metatarsalia	Ossa metapodalia	P. proximales	P. mediae	P. distales		Ossa sesamoidea
MAMMALIAN SPECIES AND/OR GROUPS															
Medium sized monkey (<i>Cercopithecus/Colobus</i>)	-	-	-	1	1	-	-	-	-	-	-	-	-	-	3
Hare (<i>Lepus/Poelagus</i>)	2	2	-	2	-	-	1	-	6	-	-	-	-	-	26
Marsh cane rat (<i>Thryonomys swinderianus</i>)	1	2	-	1	-	-	-	-	-	-	-	-	-	-	19
Jackal (<i>Canis</i> sp.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Spotted-necked otter (<i>Lutra maculicollis</i>)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	6
Clawless otter (<i>Aonyx</i> sp.)	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
Medium felid (<i>Felis</i> sp.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lion (<i>Panthera leo</i>)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Small carnivore	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Aardvark (<i>Orycteropus afer</i>)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	3
Rhinoceros (<i>Diceros/Ceratotherium</i>)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Zebra (<i>Equus burchelli?</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Bushpig (<i>Potamochoerus porcus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Warthog (<i>Phacochoerus aethiopicus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Bushpig and/or warthog	-	-	-	2	-	-	-	-	1	3	7	-	3	-	17
Giant forest hog (<i>Hylochoerus meinertzhageni</i>)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2
Hippopotamus (<i>Hippopotamus amphibius</i>)	8	4	1	1	-	2	-	1	1	2	4	2	1	1	96
Oribi (<i>Ourebia ourebi</i>)	-	-	-	-	-	-	-	-	-	-	2	1	1	-	5
Small wild bovids, mainly oribi	-	4	-	3	-	5	6	-	1	-	-	-	1	-	52
Bushbuck (<i>Tragelaphus scriptus</i>)	-	-	-	1	-	-	-	-	-	-	-	-	1	-	11
Sitatunga (<i>Tragelaphus spekei</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Tragelaphine antelopes, mainly bushbuck	-	-	-	-	-	1	1	-	-	-	-	1	-	-	4
Bohor reedbuck (<i>Redunca redunca</i>)	-	1	-	-	-	1	-	-	1	-	2	-	5	-	26
Reduncine antelopes, mainly bohor reedbuck	-	-	-	-	-	1	1	-	-	-	-	-	-	-	6
Medium wild bovids	12	6	1	12	1	1	4	-	6	7	3	3	-	-	97
Topi (<i>Damaliscus lunatus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11
Alcelaphine antelopes, mainly topi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	218
Waterbuck (<i>Kobus ellipsiprymnus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Greater kudu (<i>Tragelaphus strepsiceros</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Roan antelope (<i>Hippotragus equinus</i>)	-	-	-	-	-	2	-	-	-	-	1	-	-	-	10
Large wild bovids, mainly topi	44	12	1	19	2	19	19	20	34	28	52	17	15	24	482
Large wild bovids, other than topi	2	-	1	2	1	1	-	2	3	3	3	2	-	-	36
Eland (<i>Taurotragus</i> sp.)	2	2	-	1	-	4	1	1	-	-	1	-	2	-	22
Giant buffalo (<i>Pelorovis antiquus</i>)	1	-	-	-	-	1	2	-	5	1	1	-	1	-	15
Very large wild bovids	3	-	-	1	-	2	1	-	-	-	2	1	-	5	26
Unclassified wild bovids (<i>Bovidae Indet.</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
TOTALS	75	33	4	47	5	38	40	24	57	45	80	27	32	30	1 241

with our "very large wild bovid" category. VAN NEER (1981) also considers a very small antelope category, which would include species such as the blue duiker (*Cephalophus monticola*). This category is not represented in the Ishango samples.

The absolute frequencies found in Table 6 are based on specimen counts. The sequence in which the mammalian orders and families are described and listed follows essentially ANDERSON & JONES (1967).

Medium sized monkey (*Cercopithecus* and/or *Colobus*)

The two major Ishango assemblages yielded five bone fragments of a medium sized monkey. These remains cannot be ascribed specifically because of the lack of distinctive features and the fact that several species may have occurred in the area. Among the possible candidates we cite the grivet (*Cercopithecus aethiops*),

the mitis (*Cercopithecus mitis*) and the magistrate colobus (*Colobus guereza*).

Hare (*Lepus* and/or *Poelagus*)

Lagomorph remains are limited to the N.F.PR. assemblage. They consist of an incomplete mandibula and a number of postcranial fragments from subadult and adult individuals. The size of the bone material matches well with that from recent small to medium sized Cape hare (*Lepus capensis*). However, two other lagomorphs may have contributed to the samples : Whyte's hare or Crawshay's hare (*Lepus whytei*) and the Uganda grass hare (*Poelagus marjorita*).

Marsh cane rat (*Thryonomys swinderianus*)

Bone fragments of adult and immature marsh cane rats were found in the N.F.PR., N.TUF and Z.POST-EM. deposits. Their identification is based on their

Table 8a : Intraskelatal distribution of the mammals found in the Z.POST-EM. deposits (part 1).

Z.POST-EM. SKELETAL ELEMENT															
	Ossa cranii : Proc. corn.	Ossa cranii : others	Ossa faciei : maxilla	Ossa faciei : mandibula	Dentes superiores	Dentes inferiores	Dentes <u>indet.</u>	Atlas	Axis	Scapula	Humerus	Radius	Ulna	Ossa carpi	Ossa metacarpalia
MAMMALIAN SPECIES AND/OR GROUPS															
Medium sized monkey (<i>Cercopithecus/Colobus</i>)	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-
Marsh cane rat (<i>Thryonomys swinderianus</i>)	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Porcupine (<i>Hystrix</i> sp.)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Cane rat or porcupine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cape hunting dog (<i>Lycaon pictus</i>)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Lion (<i>Panthera leo</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small carnivores	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Medium carnivore	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Dassie (<i>Dendrohyrax arboreus</i> ?)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Rhinoceros (<i>Diceros/Ceratotherium</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Zebra (<i>Equus burchelli</i> ?)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Bushpig (<i>Potamochoerus porcus</i>) (1)	-	-	1	2	1	-	-	-	-	-	-	-	-	-	-
Warthog (<i>Phacochoerus aethiopicus</i>)	1	-	-	-	-	-	6	-	-	-	-	-	-	-	-
Bushpig and/or warthog	-	-	-	-	-	1	-	1	-	-	-	1	-	1	-
Hippopotamus (<i>Hippopotamus amphibius</i>)	-	4	-	-	-	-	30	-	-	1	2	-	-	3	1
Oribi (<i>Ourebia ourebi</i>)	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small wild bovids, mainly oribi	-	-	-	-	5	2	-	1	-	2	2	-	-	-	-
Bushbuck (<i>Tragelaphus scriptus</i>)	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Tragelaphine antelopes, mainly bushbuck	-	-	-	-	-	-	-	-	-	-	1	-	-	5	-
Bohor reedbuck (<i>Redunca redunca</i>)	-	-	-	-	4	4	-	-	-	-	2	-	-	5	-
Kob (<i>Kobus kob</i>)	-	-	-	1	1	3	-	-	-	-	-	-	-	-	-
Reduncine antelopes, mainly bohor reedbuck	-	-	-	-	-	-	-	-	-	-	-	1	-	3	-
Medium wild bovids	-	-	-	-	-	-	-	-	-	3	8	2	-	1	-
Topi (<i>Damaliscus lunatus</i>)	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alcelaphine antelopes, mainly topi	-	-	-	1	50	42	-	-	-	-	-	-	-	-	-
Waterbuck (<i>Kobus ellipsiprymnus</i>)	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Roan antelope (<i>Hippotragus equinus</i>)	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Large wild bovids, mainly topi	-	-	-	-	-	5	-	-	1	2	11	6	1	23	5
Large wild bovids, other than topi	-	-	-	-	-	4	-	-	1	-	-	3	-	2	-
Eland (<i>Taurotragus</i> sp.)	1	-	-	-	-	-	-	-	-	-	1	-	-	2	-
African buffalo (<i>Syncerus caffer</i>)	-	-	-	-	3	10	-	-	-	-	1	-	-	-	-
Very large wild bovids	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Unclassified wild bovids (<i>Bovidae indet.</i>)	5	-	-	-	-	-	14	-	-	-	-	-	-	-	-
TOTALS	17	4	1	4	65	78	52	2	2	8	30	13	2	46	7

(1) The bushpig remains are derived from one individual.

morphology and on their relative size. They preclude an identification as savanna cane rat (*Thryonomys gregorianus*), giant rat (*Cricetomys gambianus*), Emin's giant rat (*Cricetomys emini*), African brush-tailed porcupine (*Atherurus africanus*), Cape porcupine (*Hystrix africae-australis*) or North African porcupine (*Hystrix cristata*).

Some measurements on the better preserved N.F.PR. specimens are given in Table 9. We compared these values with those obtained by VAN NEER (1981, vol. 2, tables 16 to 20 and 129) on over forty marsh cane rats from all over Africa, but mainly from Zaire. If this recent sample reflects the variation of the tooth dimensions of recent *T. swinderianus*, and if the Ishango specimens are representative for the fossil population, then it must be concluded that the individuals taken by the Ishango people were on average larger than the modern form.

The N.TUF. and Z.POST-EM. assemblages yielded only a few postcranial remains; they did not allow reliable measurements.

Porcupine (*Hystrix* sp.)

Only one molar from the Z.POST-EM. could be assigned to this genus. A specific identification of this specimen is for the moment impossible : Ishango lies within the area where two porcupine species occur sympatrically : the North African porcupine (*Hystrix cristata*) and the Cape porcupine (*Hystrix africae-australis*).

Cane rat or porcupine (*Thryonomys* or *Hystrix*)

The Z.POST-EM. assemblage produced a fragment of a femur shaft derived from an immature individual. This specimen could not be attributed with certainty to one of the two larger rodents mentioned above.

Jackal (*Canis* sp.)

A jackal is represented by two incomplete scapulae from the N.F.PR. assemblage. On the basis of their present day distribution, three jackal species have to be taken into account, namely the side-striped jackal (*Canis*

Table 8b : Intraskelatal distribution of the mammals found in the Z.POST-EM. deposits (part 2).

Z.POST-EM. SKELETAL ELEMENT	Os coxae	Os femoris	Patella	Tibia	Fibula/Os malleolare	Ossa tarsi : Talus	Ossa tarsi : Calcaneus	Ossa tarsi : Others	Ossa metatarsalia	Ossa metapodalia	P. proximales	P. mediae	P. distales	Ossa sesamoidea	TOTALS
Medium sized monkey (<i>Cercopithecus/Colobus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Marsh cane rat (<i>Thryonomys swinderianus</i>)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	3
Porcupine (<i>Hystrix</i> sp.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Cane rat or porcupine	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Cape hunting dog (<i>Lycaon pictus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lion (<i>Panthera leo</i>)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Small carnivores	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2
Medium carnivore	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Dassie (<i>Dendrohyrax arboreus</i> ?)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Rhinoceros (<i>Diceros/Ceratotherium</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Zebra (<i>Equus burchelli</i> ?)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Bushpig (<i>Potamochoerus porcus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Warthog (<i>Phacochoerus aethiopicus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Bushpig and/or warthog	-	-	-	-	-	1	1	1	-	-	2	1	-	-	10
Hippopotamus (<i>Hippopotamus amphibius</i>)	1	3	-	2	-	2	-	3	-	-	7	-	1	1	61
Oribi (<i>Ourebia ourebi</i>)	-	-	-	-	-	-	-	1	-	-	-	1	1	-	5
Small wild bovids, mainly oribi	-	3	-	3	-	5	1	1	1	6	2	-	-	-	35
Bushbuck (<i>Tragelaphus scriptus</i>)	-	-	-	-	-	-	-	-	-	3	-	-	1	-	6
Tragelaphine antelopes, mainly bushbuck	-	-	-	-	-	1	-	-	1	-	-	-	-	-	8
Bohor reedbuck (<i>Redunca redunca</i>)	-	-	-	-	-	5	-	2	-	3	-	1	-	-	26
Kob (<i>Kobus kob</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Reduncine antelopes, mainly bohor reedbuck	-	-	-	-	-	4	-	-	-	-	-	-	-	-	8
Medium wild bovids	3	6	-	5	-	5	5	1	2	4	5	2	-	1	53
Topi (<i>Damaliscus lunatus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Alcelaphine antelopes, mainly topi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93
Waterbuck (<i>Kobus ellipsiprymnus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Roan antelope (<i>Hippotragus equinus</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Large wild bovids, mainly topi	11	6	1	10	4	30	10	12	7	34	27	9	-	4	219
Large wild bovids, other than topi	-	1	-	-	-	2	-	-	-	1	2	1	-	-	18
Eland (<i>Taurotragus</i> sp.)	-	-	-	-	-	1	1	-	-	-	-	-	-	-	6
African buffalo (<i>Synceus caffer</i>)	-	-	-	1	-	-	-	-	-	1	-	-	-	-	16
Very large wild bovids	-	-	-	-	-	-	1	2	-	-	1	-	-	1	6
Unclassified wild bovids (<i>Bovidae indet.</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
TOTALS	15	21	1	21	4	56	19	23	12	52	47	15	3	8	628

Table 9 : Comparison of tooth measurements of recent and fossil *Thryonomys swinderianus*.

Ishango specimens (N.F.PR.)	Recent <i>Thryonomys</i> (1)			
	range	n	\bar{x}	s
Maxilla, P4-M3, AL (2) : 22.5	17.3-21.4	34	18.70	0.96
P4, CB : 7.5	5.1- 6.8	44	5.78	0.39
M1, CB : 8.4	5.5- 7.8	44	6.67	0.46
M2, CB : 9.1	6.1- 7.8	40	7.07	0.50
Mandibula, P4-M3, AL : 23.9 24.2 24.5 25.0	21.7-24.6	33	22.83	0.88
M1, CB : 5.8 5.2 5.8 6.0	4.9- 6.2	43	5.54	0.35
M2, CB : 6.4 6.4 6.7 7.1	5.4- 7.1	39	6.28	0.40
M3, CB : 5.8 - 6.7 6.2	5.5- 6.8	31	6.25	0.35
Upper incisors I1, CB : 5.2 7.4	4.1- 7.1	43	5.59	0.77
CD : 4.7 6.9	3.6- 6.1	43	4.90	0.65

(1) Based on VAN NEER, 1981, Vol. 2, Tables 16 to 20.

(2) AL= Alveolar Length

adustus), the black-backed jackal (*C. mesomelas*) and the golden jackal (*C. aureus*). Unfortunately, a distinction between the three species based on the osteomorphology cannot be made for the moment.

Cape hunting dog (*Lycaon pictus*)

The Cape hunting dog or African wild dog is represented in the Z.POST-EM. sample by an incomplete premolar. Both the morphology of its cusps and its relative size exclude an identification as jackal or fox.

Spotted-necked otter (*Lutra maculicollis*)

The older deposits yielded a few remains which are derived from a medium sized mustelid. They can be referred to the spotted-necked otter on the basis of their lutrine morphology, their relative size and the fact that only one otter of this size occurs in subsaharan Africa. To the north, it is replaced by its near relative, the

common otter (*Lutra lutra*).

One of the mandibles, found by us in the N.F.PR. collection, may well correspond to the one described by HOPWOOD & MISONNE from the G.INF. (cf. Table 5).

Clawless otter (*Aonyx* sp.)

Clawless otters are represented by two calcanea, one from an adult, the other from a subadult animal. Two species may have lived near Ishango at the time the site was inhabited, namely the Zaire clawless otter (*Aonyx congica*) and the Cape clawless otter (*Aonyx capensis*).

Medium felid (*Felis* sp.)

An incomplete humerus, collected in the N.F.PR. deposits, can be assigned to a medium sized felid. Three such cats may have occurred in the immediate vicinity of Ishango : the caracal (*Felis caracal*), the serval (*F. serval*) and the golden cat (*F. aurata*). Circumstantial evidence makes us favour the caracal, which tolerates more arid conditions than the serval or golden cat.

Lion (*Panthera leo*)

A third phalanx from the N.F.PR. assemblage and a first phalanx from the Z.POST-EM. deposits can be assigned to lion.

Small and medium carnivores

Both major assemblages yielded some bones of carnivores which we could not identify more specifically. We place them into two categories according to their relative size. The small carnivore remains probably pertain to small sized mustelids or viverrids, while the medium carnivore bones may have belonged to viverrids of somewhat larger size.

Aardvark (*Orycteropus afer*)

The aardvark or antbear is represented by an incomplete ulna, a first phalanx and a complete fifth metacarpal, all derived from adult animals and found in the N.F.PR. deposits. The identification of these remains does not pose particular problems since the aardvark skeleton exhibits very typical features (FRECHKOP, 1937; GRASSE, 1967).

Dassie (*Dendrohyrax arboreus* ?)

An incomplete hyrax mandible with the three molars still *in situ* has been found in the Z.POST-EM. deposits. Because the teeth are brachyodont, an identification of this specimen as *Procavia* can be excluded (HAHN, 1934; ALLAERTS *et al.*, 1982). Unfortunately, it is not possible to assign this jaw definitely to one of the two remaining genera, *Dendrohyrax* or *Heterohyrax*. Yet, *Dendrohyrax* is still met frequently near Ishango, whereas *Heterohyrax* has never been recorded from the area (ROBYNS, 1948 : 38). Hence, circumstantial evidence favours an identification of the fossil specimen as *Dendrohyrax*. HALTENORTH & DILLER (1979 : 108) list only one species of tree hyrax, namely *D. arboreus*. Therefore, the Ishango specimen is tentatively assigned to this species.

Rhinoceros (*Diceros bicornis* or *Ceratotherium simum*)

Two specimens, a third phalanx from the N.F.PR. deposits and a second carpal found in the Z.POST-EM. collection, can be assigned to rhinoceros. Measurements on these specimens, taken according to GUERIN (1980), and a comparison of them with recent material did not reveal enough differences to assign them to either the black rhino (*Diceros bicornis*) or the white rhino (*Ceratotherium simum*).

Zebra (*Equus burchelli* ?)

At Ishango, equids are represented by an incomplete scapula (N.F.PR.) and an upper jugal tooth (Z.POST-EM.). On the basis of zoogeographical considerations (GROVES, 1974 : 129) these specimens are most likely referable to Burchell's zebra.

Bushpig (*Potamochoerus porcus*)

Cranial and dental remains of bushpig have been found in three levels (Table 6). The morphology of these elements differs clearly from that found in the two other African suids which occur presently in the Ishango area, i.e. warthog (*Phacochoerus aethiopicus*) and giant forest hog (*Hylochoerus meinertzhageni*).

Warthog (*Phacochoerus aethiopicus*)

Some twenty cranial fragments, mostly teeth, can be attributed to warthog. These remains are encountered in the same stratigraphical units as those of bushpig.

Bushpig and/or warthog

A number of postcranial and a few cranial fragments could not be attributed to one of the suids mentioned before, because typical osteomorphological features (VAN NEER, 1981, vol. 1 : 102-103) are lacking due to the pronounced fragmentation.

Giant forest hog (*Hylochoerus meinertzhageni*)

Two postcranial fragments, an incomplete scapula (GLP 53.5) and a first phalanx (*Digitus II or V*; GL 29.5; Bp 17.9; Bd 13.2) collected in the N.F.PR. deposits, exhibit a typical suid morphology. However, their size clearly surpasses that of their homologues in bushpig and warthog. We therefore assign these specimens to the giant forest hog.

Hippopotamus (*Hippopotamus amphibius*)

Hippopotamus bones are well preserved in the Ishango deposits : more than 150 specimens in three stratigraphical units (Table 6). Cranial as well as postcranial bones could be ascribed to this large mammal because of their typical morphology. A number of measurements on specimens from the Ishangian levels were compared with their homologues obtained on recent skeletons by different authors (HOOIJER, 1950; HOUTEKAMER & SONDAAR, 1979; FAURE, 1985; cf. Table 10). The fossil specimens all match with the larger recent individuals, or even surpass them in size. The Z.POST-EM. remains were too fragmented to allow reliable measurements or comparisons.

Table 10 : Comparison of bone measurements of recent and fossil *Hippopotamus amphibius*.

Ishango specimens (N.F.PR./N.TUF.)	Recent <i>Hippopotamus</i>				
	HOOIJER (1950)	HOUTEKAMER & SONDAAR (1979)	FAURE (1985)		n
			range		
Scapula, SLC : 111 119	115 123	- -	-	-	-
LG : 100 106	100 101	- -	-	-	-
BG : 87 90	76 88	- -	-	-	-
Humerus, BT : 138	- -	- -	107-133	-	11
Bd : 161	144 153	131 155	117-145	-	11
Radius, GL : 290	- -	270 293	250-294	-	12
Bp : 110	102 109	98 105	81-108	-	12
SD : 55	45 46	42 45	42- 52	-	12
Ulna, BPC : 95	- -	85 86	68- 91	-	9
Os metacarpale II, Gl : 132	- -	110 134	107-143	-	10
Bp : 39	35 38	34 36	29- 40	-	9
Bd : 45	38 41	33 38	33- 46	-	9
Os metacarpale III, Bp : 61 63	- -	52 57	46- 54	-	11
Os metacarpale IV, Bp : 56 60	- -	- -	43- 57	-	11
Talus, GLI : 94 107	105 106	- -	77-104	-	10
Bd : 80 97	91 98	- -	69- 86	-	10
Os metatarsale II, GL : 109	93 107	- -	80-106	-	12
Bp : 36	27 31	- -	23- 31	-	12
Bd : 40	33 35	- -	30- 37	-	12
P. prox., III or IV, GL: 72	67 69	- -	-	-	-
Bp : 55	51 54	- -	-	-	-
Bd : 47	45 46	- -	-	-	-

Oribi (*Ourebia ourebia*)

Several horn core fragments, a few incomplete mandibles and some postcranial bones are ascribed to oribi on the basis of their morphology. In fact, this is the only species that we could recognise among the small antelope remains. Very probably these specimens are the same which HOPWOOD & MISONNE (1959) identified as *Cephalophus* sp. However, the osteomorphology of duikers is totally different from that of oribi (cf. VAN NEER, 1981, vol. 1 : 124-129; vol. 2 : pl. 59-70), and there can be no doubt as to the identity of the Ishango remains.

Small wild bovids, mainly oribi

A number of bone fragments of small antelopes could not be identified more specifically due to the lack of distinctive characteristics. Several species, still present in eastern and northeastern Zaire may have contributed to the sample, such as the savanna duiker (*Sylvicapra grimmia*), the black-fronted duiker (*Cephalophus nigrifrons*) or the klipspringer (*Oreotragus oreotragus*). As all identifiable remains of small wild bovids pertain to oribi, it can be expected that this species predominates in the small bovid sample.

Bushbuck (*Tragelaphus scriptus*)

Both major assemblages yielded several bone fragments referable to bushbuck. The identification of the dental material is based on direct comparison with recent skulls and with the occlusal teeth patterns figured in GENTRY (1978). The postcranial remains are

recognised because of their typical morphology and small size (PETERS, 1986c).

Sitatunga (*Tragelaphus spekei*)

A lower third premolar from the N.F.PR. deposits should most likely be assigned to this antelope; its occlusal length is 11.2 mm.

Tragelaphine antelopes, mainly bushbuck

A number of bone fragments from the two major assemblages exhibit clear tragelaphine features. However, their size does not permit to ascribe them definitely to one of the already mentioned *Tragelaphus* species. The measurements match or even exceed recent male bushbuck and fit also small sitatunga. As bushbuck dominates in our samples, we assume that most of the Ishango specimens are derived from this antelope.

Bohor reedbuck (*Redunca redunca*)

Some 50 bone fragments from the major levels can be ascribed to a reedbuck (*Redunca* sp.). The horn cores and tooth fragments were identified by direct comparison with their recent homologues. The postcranial material has been recognised as reduncine on the basis of certain osteomorphological features (PETERS, 1986c). Biogeographical evidence suggests that we are dealing with bohor reedbuck. However, a comparison between the size of the Ishango specimens and that of recent skeletal elements (VAN NEER, 1981, vol. 2, tables 98-101; PETERS, *ibid.*; table 11) illustrates that the Ishango material falls into the upper size range of recent bohor; part of the sample is derived from even larger individuals. Yet it does not appear probable to us that the larger southern reedbuck (*Redunca arundinum*) is present in the samples, because its present-day northern limit lies too far south.

Kob (*Kobus kob*)

The Z.POST-EM. collection yield an incomplete mandible and a few upper and lower molars which we ascribe on the basis of tooth morphology and relative size to kob.

Reduncine antelopes, mainly bohor reedbuck

A number of bone specimens exhibit typical reduncine osteomorphological features, but measurements indicate that they may have pertained to larger bohor or smaller kob individuals. Circumstantial evidence, in this case the dominance of reedbuck over kob among the identified specimens in our samples, favours an identification of these as bohor reedbuck, especially for the N.F.PR. assemblage where remains of kob are lacking.

Medium wild bovids

We grouped a considerable number of bone fragments within this category because they were too fragmented to assign them specifically. Most likely, they are derived from individuals of the species and genera already mentioned.

Table 11 : Comparison of bone measurements of recent and fossil *Redunca*.

Ishango specimens (N.F.PR./Z.POST-EM.)	Recent <i>Redunca</i>					
	VAN NEER (1981)				PETERS (1986c)	
	<i>R. redunca</i>		<i>R. arundinum</i>		<i>R. redunca</i>	
	range	n	range	n	range	n
Humerus, Bd : 36.4	30 -35	3	36 -42	4	28.5-35.5	5
BT : 34.7 34.0 34.3	29 -33	3	36 -39	4	26.5-32.5	5
Os carpi radiale, GD : 20.2 21.7 21.8	-	-	-	-	16.5-22.1	5
GH : 16.9 17.4 17.9	-	-	-	-	15.2-17.1	5
Bfd : 10.2 10.6 11.7	-	-	-	-	9.6-11.1	5
Os carpi intermedium, GD : 22.0	-	-	-	-	18.5-21.3	5
GH : 16.3	-	-	-	-	14.7-16.7	5
Talus, GL1 : 36.0 36.5 36.7 37.8	34 -37	2	40 -45	4	33.0-37.5	5
G1m : 33.9 34.6 33.7 35.8	32 -35	2	35 -40	4	30.5-35.0	5
D1 : 19.9 19.9 19.4 21.1	18 -20	2	22 -24	4	18.3-20.2	5
Bd : 21.1 22.1 20.9 22.5	19 -21	2	23 -26	4	18.7-21.6	5
Os centroquartale, GB : 28.5 28.6	23 -26	2	29 -33	4	22.5-27.5	5
Phalanx media, GL : 26.9	24 -28	6	27 -31	4	23.7-24.8	4
Bp : 11.8	9.5-11.5	6	11.7-13.0	4	9.0-10.9	4
Bd : 9.7	8.1-10.4	6	9.7-10.8	4	8.2- 8.6	4
Phalanx distalis, DLS : 31.7 33.8 36.5	27 -32	6	36 -41	4	28.5-32.0	4
Ld : 27.3 29.3 31.5	23 -27	6	31 -36	4	23.9-29.0	4
BFP : 10.0 10.2 9.9	8.1- 9.7	6	9.7-10	4	8.6- 9.4	4

Topi (*Damaliscus lunatus*)

Five more or less complete horn cores and some fifteen horn core fragments can be attributed to topi because of their typical lyrate form. The size of the nearly complete specimens is on average larger than those from recent male individuals.

Hartebeest (*Alcelaphus buselaphus*)

Hartebeest is represented in the bone samples by an incomplete though typical horn core fragment. According to the museum labels, this specimens has been found in the N.TUF. deposits. However, HOPWOOD & MISONNE (1959) list an *Alcelaphus* horn core from the G.INF. level (Table 5). We assume that our specimen is identical to the one described earlier, as it is the only hartebeest horn core found in the entire collection.

Alcelaphine antelopes, mainly topi

Alcelaphine teeth, complete as well as incomplete, are quite abundant in the Ishango collection. They are easily recognised because of their typical enamel pattern. Table 12 summarizes some measurements on the best preserved specimens from the major levels, as well as a series of measurements obtained on recent individuals

by VAN NEER (1981, vol. 2, tables 28 & 29). Many Ishango teeth fit within the upper size range of topi, but there is considerable overlap with measurements on hartebeest molars, which are generally a bit larger than the ones in topi. The fact that in the two major assemblages only the presence of topi was established accurately on the basis of the horn cores suggests that most dental material, if not all, belongs to this species.

Waterbuck (*Kobus ellipsiprymnus*)

Among the large antelope remains collected in all three levels, some cranial as well as some postcranial bones show typical reduuncine features. Their large size corresponds to that found in recent waterbuck.

Greater kudu (*Tragelaphus strepsiceros*)

One upper M1 (OL 21.2) and a lower molar fragment from the N.F.PR. deposits exhibit the typical tragelaphine enamel patterns as figured in GENTRY (1978). We ascribe them to greater kudu because their size match well with similar teeth in recent individuals.

Roan antelope (*Hippotragus equinus*)

Twelve, mainly cranial bone fragments collected in the N.F.PR. and Z.POST-EM. deposits can be assigned to a

Table 12 : Comparison of measurements of recent and fossil mandibular teeth of Alcelaphinae

Mandibular teeth	M1/2, Occlusal Length				M3, Occlusal Length			
	range	n	\bar{x}	s	range	n	\bar{x}	s
N.F.PR. specimens	18.1-22.5	24	20.4	1.23	25.0-31.3	8	28.5	2.13
Z.POST-EM. specimens	20.3-22.3	4	21.3	0.83	27.5-30.5	5	28.7	1.53
Recent <i>D. lunatus</i> (1)	13.1-22.0	40	18.6	2.41	23.1-28.6	20	26.4	1.55
Recent <i>A. buselaphus</i> (1)	13.9-23.2	40	19.4	2.35	24.0-31.7	20	27.2	2.04

(1) Values obtained by VAN NEER on recent skull material (1981, Tables 28 & 29)

hippotragine antelope. Two such antelopes may have roamed near Ishango in prehistoric times, the roan antelope (*Hippotragus equinus*) and the more slenderly built sable antelope (*Hippotragus niger*). The proportions and size of the fossil specimens match much better the larger roan and are therefore attributed to this species.

Large wild bovids, mainly topi/other than topi
Bone fragments from large wild bovids dominate all the Ishango samples. Most of the fossil specimens clearly exhibit alcelaphine features (PETERS, in prep.). The bulk of this material can be assigned to topi on the basis of circumstantial evidence (see above).

Some 50 skeletal elements could not be included in the previous group because of differences in morphology and size. We list them separately in table 6 under the heading "Large wild bovids other than topi."

Eland (*Taurotragus* sp.)

Eland are represented by 26, mainly postcranial bone fragments from the two major assemblages. The morphology as well as the large size of the specimens corroborates an identification as eland. For the moment, however, we cannot decide whether we are dealing with the common eland (*Taurotragus oryx*) or with the derby eland (*T. derbianus*). Both elands may have occurred near Ishango in earlier times.

African buffalo (*Syncerus caffer*)

The Z.POST-EM. deposits yielded several tooth fragments and postcranial remains which cannot but be derived from African buffalo. Measurements on the better preserved specimens follow : lower P4, OL 21.6; lower M1, OL 26.8 and distal humerus, BT 99. Both the size of these specimens and the size of the fragments which could not be measured reveals that we are dealing solely with a savanna form of the African buffalo, most likely *Syncerus caffer caffer*. This view is opposite to the one held by HOPWOOD & MISONNE, who believed that both the savanna and the forest form (*S. c. nanus*) were present at Ishango during prehistoric times.

Giant buffalo (*Pelorovis antiquus*)

Remains derived from a very large bovine species are restricted to the Ishanganian levels. They are assigned to giant buffalo because firstly their size clearly surpasses that of their homologues in present-day savanna buffalo (Table 13), and secondly because certain skeletal elements such as the metapodials, appear to be more slenderly built than their counterparts in recent buffalo. In the past, osteomorphological and -metrical studies on giant buffalo primarily focused on the animal's skull with its typical horn cores. On the other hand, the morphology of the postcranial skeleton barely received any attention, and information about the size of the different postcranial elements of *Pelorovis** is restricted to publications by THOMAS (1881), POMEL (1893), ARAMBOURG *et al.* (1934), LÖNNBERG (1934), GENTRY (1967) and a few others. We therefore thought it useful to compare some of the measurements obtained on the Ishango material with those given in earlier publications (Table 13).

The presence of this species at Ishango is not contradictory to what we know about its distribution. Indeed, several other Quaternary sites in northern, eastern and southern Africa produced remains of this very large herbivore (POMEL, *ibid.*; COOKE, 1948, etc). It apparently survived until the end of the Pleistocene in South Africa (KLEIN, 1976, 1978, 1980) and may have occurred in the Sahara until the end of the early Holocene moist phase ca. 5000-4000 years ago (KLEIN, 1984).

* Three Late Pleistocene giant buffaloes are described in literature, namely the north African *Bubalus antiquus*, the east African *B. nilsoni* and the south African *B. baini*. We have followed GENTRY (1978) who argues for the presence of only one species of giant buffalo in Africa, which should then be named *Pelorovis antiquus*. *Homoiceras singae* BATE 1949 is according to GENTRY (*ibid.*) a large *Syncerus*.

Table 13 : Comparison of postcranial measurements of giant buffalo (*Pelorovis antiquus*) from several African sites.

Skeletal element	Species	<u>Pelorovis antiquus</u>			<u>Syncerus caffer</u>		
	Site	Djelfa(1)	Melawa(2)	Ishango		Recent(3)	
						Range	n
Upper M1, OL		33	31	33.6	35.5	-	-
Upper M2, OL		43	34	37.2	38.2	-	-
Talus, GL1		90	100	92	96	62 - 81	16
GLm		85	92	87	91	59 - 78	16
D1		50	54	51.0	52.5	33.0- 45.5	16
Bd		64	73	68.0	66.0	39.0- 55.0	16
Calcaneus, GL		170	195	165	-	118 -155	15
Bp		50	60	47.0	-	33.5- 42.0	15
DS		-	-	67.0	-	40.5- 57.5	15
Bd		-	-	77	-	51 - 66	15
Os metatarsale III+IV, Bp		70	84	70	75	47 - 61	24
Dp		60	72	59.0	65.0	40.5- 53.0	24
Bd		80	101	76	-	49 - 72	24
Dd		-	-	44.5	-	31.0- 41.5	24
P. prox. manus, GLPe		68	-	70	-	56 - 70	25
GLAx		70	-	68	-	53 - 68	25
Bp		37	-	36.5	-	29.0- 40.5	25
Bd		38	-	34.0	-	28.5- 39.0	25
P. dist. manus, DLS		-	-	83	-	59 - 81	19
Ld		-	-	69	-	49 - 71	19
HP		-	-	51.0	-	33.0- 48.0	19
BFp		-	-	28.5	-	21.0- 30.0	19

(1) Values obtained by POMEL (1893) on a skeleton found near Djelfa in Algeria.

(2) Values obtained by LÖNNBERG (1934) on a skeleton discovered at the borders of the Melawa River in Kenya.

(3) Values obtained on recent African buffalo from different areas in Africa (PETERS, 1986b)

It should be stressed that *Pelorovis* remains are restricted to the Ishangian levels, while African buffalo has only been observed in the Z.POST-EM. assemblage.

Very large wild bovids

This category comprises the specimens that were too fragmented to assign them to one of the similar sized genera mentioned before, namely *Taurotragus*, *Pelorovis* and *Syncerus*.

Unclassified bovids (*Bovidae indet.*)

A number of heavily fragmented remains, mainly tooth splinters, could not be definitely classified in one of the wild bovid classes given above. They are grouped into this category.

2.6. Bone modifications

Modifications of bone surfaces are observed regularly and several kinds could be recognised : modifications due to man, gnawing marks, cutting marks, bone pathology and bone abrasion.

A considerable amount of modified bone has been found in the Ishangian levels (cf. de HEINZELIN, 1957), but indications as to the manufacturing techniques and the identity of the skeletal element they are derived from are lacking. However, for the manufacturing of the harpoons people may have used the shafts of the metapodials of topi. In the Ishangian levels topi metapodials are represented by numerous proximal and distal ends, while shaft fragments are almost entirely lacking. On the other hand, because of their low nutritional value, metapodials may escape butchering and cooking and are therefore often entirely preserved in archaeological deposits. Thus, it is not impossible that the discrepancy noted at Ishango is indeed related to the activity of the site inhabitants.

Gnawing marks made by rodents or carnivores are rare at Ishango. Only one tarsal bone, presumably of topi, exhibits a number of gnawing marks left by a small to medium sized rodent.

The number of cutting marks is low. We noticed clear examples on a few ribs from large wild bovids and also on a carpal bone of bohor reedbuck. A few fragments from long bones furthermore illustrate a quite untypical splitting pattern, oblique to the axis of the bone. This may be the result of cutting or chopping activities on fresh bone.

Bone pathologies are rare within the bone samples. The most striking case concerns the lower jaw of an oribi in which the P4, M1 and M2 are worn below the normal occlusal level (Pl. II, fig. 15). According to BAKER & BROTHWELL (1980 : 147), several causes can be given to explain such abnormalities.

A few bone specimens have been submitted to rolling or to some other kind of abrasion process.

3. TAPHONOMY

3.1. Site formation processes

As noted by de HEINZELIN, the sediments and archaeological remains in all three levels of the Ishango culture reflect accumulation on the fluctuating shore of a rising lake. The changing facies of gravels and sands in the excavated Ishangian horizons appear to be comparable with shoreline accumulations on the modern beach, which lies circa 12 m below the site. Because much of the bone was covered with a coarse matrix, the Ishangian assemblage was interpreted as the result of dumping of residential debris either into the lake or onto a small adjacent beach. An argument that supported this view was the fact that much of the N.F.PR. bone appeared to be heavily rolled (de HEINZELIN, 1955 : 11). In their recent evaluation of the Ishango complex, BROOKS & SMITH (1987) state that "... Much of the bone, particularly in the NFP (= N.F.PR.), is heavily rolled and covered with a sandy concretion, indicating secondary deposition in a beach context. It is thus unlikely that most of the debris was directly associated with a residential camp. Similar accumulations of shell, fish bone, and prehistoric artefacts including bone harpoons derived from erosion of older deposits can be observed forming today on the modern shoreline ...". Thus, if we understand the term "secondary deposition" correctly, BROOKS & SMITH assume that the original thanatocoenosis has been reworked, transported, and finally deposited elsewhere by natural processes.

When analysing the faunal remains from the N.F.PR., we observed that only a few specimens showed traces of being rolled. In fact, we noted that morphological characteristics, which enabled us to recognise over 25 mammalian species, were preserved on most bones with many very fine details. Furthermore, a number of smaller bones such as the metapodials of hares, which we expect to disappear or at least to be broken when deposited or moved around near the shoreline of a beach are preserved entirely. Thus, our observations do not confirm those made by the excavators. Unless it can be demonstrated that the samples sent to Belgium have been sorted out in the field, resulting in a negative bias against rolled specimens, we must consider other possibilities of site formation.

According to us, the N.F.PR. assemblage can also be interpreted as the result of garbage dumping into the lake (= secondary refuse *sensu* SCHIFFER, 1976), at a point where the water had a low energy regime. The fact that the garbage was dumped into the lake can probably be inferred from the observation that no gnawing marks, either from carnivores or rodents, were noted, suggesting that these animals had no access to the thanatocoenosis. In fact, this would have been the best solution also from Ishango man's point of view : no smell, no insects, no rodents and hence less chance for disease. The assumption that people threw their kitchen

refuse into the water where it was rather quiet is based on the observation that rolled specimens are very rare, that small and fragile bones are preserved entirely, and the fact that three cultural stages could be distinguished within the sequence, which might not have been the case if some "secondary deposition in a beach context" would have taken place. Finally, the coating of some of the material with sand and poorly sorted clastics, and its encrustation with sediments and molluscs most likely occurred when the assemblage was already (partly) embedded in the lake sediments.

As to the younger Z.POST-EM assemblage, the bones and the sediments reflect the conditions of a typical subaerial kitchenmidden : molluscs are absent except for some shell fragments of land snails, rodent gnawing marks are present and encrustation of the bones by coarse lake sediments did not occur.

3.2. Taphonomic groups

Before attempting a palaeoeconomical and palaeoecological evaluation of the Ishango assemblages, we should try to find out how they originated. For this purpose remains of animals with a comparable death-to-discovery history are brought together in so-called taphonomic groups (cf. GAUTIER, 1983b, 1987). In general, two main categories can be distinguished : remains from animals that arrived at the site through conscious human intervention, and those for which man cannot be held responsible. The second group is called the intrusive elements. Within the first category, we include animals or their products, for example eggs, which are brought to the site for various purposes, the most important being foodsupply. Other reasons can be clothing (skins), tool fabrication (shells, bones), adornment (feathers, shells) etc. The fact that the remains resulting from such a wide variety of uses are considered as one group reflects our inability to judge whether man killed the different animals for their meat, or solely for their skins feathers, claws, or mainly to protect himself. It is obvious, however, that most of the Ishango bone material represents animals that were brought to the site for meat consumption. Exceptions may well be the carnivores such as otters, African wild dog, jackal, lion etc, which are not often included in traditional menus. These animals are represented by cranial or terminal leg elements and perhaps these were the only parts introduced at the site together with pelts. Certain birds may have been taken because their feathers have a particular symbolic value, as is still the case with the African fish eagle (NEUNZIG, 1934), or because they interfered with human fish-harvesting (see further). As to the fish, it can be expected that the remains represent consumption refuse, including eventually offal resulting from preparation or conservation of the fish, or even fish that were thrown away because they were not suitable for consumption. On the basis of the foregoing, it becomes clear that the real importance of each major food-group in relation to the others is very difficult to gauge.

A second taphonomic group within this first category

comprises the "exotics", i.e. faunal elements that were brought to Ishango by man, but which are not derived from an animal population that lived inside the catchment area of the Ishango inhabitants. The molar of a member of the extinct proboscidean genus *Stegodon*, found in the Z.POST-EM. deposits, can be considered a manuport. According to de HEINZELIN (1957 : 13), this specimen may have been collected in the Kanyatsi area in the Lake Edward beds. Another example of an exotic element may well be the *Achatina* shell from the N.F.PR. deposits. If the identification as *A. stuhlmanni* is correct, than the shell may originate from the equatorial forest to the northwest of Ishango. Neighbouring tribes or the Ishango inhabitants themselves may be responsible for the collecting of these two exotic elements. In the youngest cultural level at Ishango (BANTOU), a cowrie shell fragment points to some form of contact with the coastal regions of East Africa during more recent times.

The second taphonomic category includes the intrusive elements, i.e. remains from animals that lived and perished at or in the vicinity of the site, or arrived in the deposits by natural processes etc. Generally they have no obvious connection with human activity. Within this category, three groups can be considered : penecontemporaneous, reworked and late intrusives. The first group comprises the faunal elements that arrived at the site more or less about the time people were using it or somewhat later. This may be the case for some shell debris of freshwater molluscs which has been washed in, and for some land snails such as *Limicolaria*, which are known to colonise sites after they have been abandoned by man (GAUTIER, 1983a).

Within the group of the reworked intrusives we can include shell fragments found in the G.INF. and N.F.PR. deposits, but originating most likely from older sediments. Other examples in this group are fish bones from the G.INF. deposits identified as *Protopterus* sp., *Clarias* sp., *Clarotes* sp. and which are thought to be of "Kaiso age" (GREENWOOD, 1959 : 27-28). A right calcaneum of an extinct giraffid, identified as *Libytherium maurusium* (HOOIJER, 1963 : 60-62, now *Sivatherium maurusium*, see CHURCHER, 1978), in the same context, is another reworked intrusive from the Lake Edward Beds.

The third group of intrusives or late intrusives include the faunal elements that are present in the fossil collections but definitely younger than the main components of the fauna. Rodents, for example, may excavate their nests in cultural layers and die in their burrows. We are not aware of any such late intrusives in the Ishango deposits.

The taphonomic status of some species is not clear yet. The N.F.PR. and N.TUF. deposits yielded a number of shell fragments of *Pila ovata* and *Etheria elliptica*. These molluscs are still consumed in certain parts of northeastern Zaire (PILSBRY & BEQUAERT, 1927 : 178-179; 454-455). Therefore, we cannot decide whether we are dealing with consumption refuse or with penecontemporaneous intrusives.

Except for the reworked intrusives, all the other animals

can be used to sketch the Ishango palaeoenvironment, whereas the remains resulting from human hunting-fishing-gathering activities may give us a clue to reconstruct the economy of Ishango man.

4. PALAEOECONOMICAL EVALUATION OF THE ISHANGO ASSEMBLAGES

4.1. Qualitative and quantitative composition of the fauna

The absolute and relative frequencies of the various animal groups are listed in Table 1. They show clearly that, although the people living at Ishango exploited a wide range of animal resources, they relied mainly on fish and mammals for their animal proteins. Traces of other important food items such as vegetables, seeds, fruits, honey, eggs etc. are lacking (de HEINZELIN, 1962). LEE (1968) has noted that recently abandoned Bushman camp sites also show an absence of vegetable remains, although it is known that plant food comprises over 60 % of the actual Bushman diet. Therefore the following discussion will inform us only about one aspect of the diet of Ishango man. As can be seen in Tables 1, 3 and 14, the diet of the Ishango inhabitants demonstrates a preference for fish and mammals. However, when we consider the live weight of the species present in the samples, it becomes clear that mammals provided most of the animal proteins for Ishango man. Reptiles and birds were only occasionally taken, whereas the importance of molluscs is difficult to gauge. Among the fish, barbels (*Barbus*) and catfishes (*Clarias*, *Synodontis*) predominate, followed by tilapias and Nile perch (*Lates*). A few other species were apparently caught only now and then and were therefore of minor importance (*Protopterus*, *Heterobranchus*). Hunting focused primarily on artiodactyls, by far the most abundant game in the area (Table 14). The most important meat suppliers were undoubtedly topi and hippopotamus, but eland, giant buffalo, bohor reedbuck and suids were also frequently consumed. Other artiodactyls that were occasionally taken are oribi, bushbuck, waterbuck, greater kudu and roan antelope. Finally, hares and marsh cane rats can be considered a small but welcome addition to the diet; the hunting of aardvark, zebra and rhinoceros occurred most likely incidentally. We do not know whether the monkey and carnivore remains pertain to consumed animals or to animals or parts of them thrown away after skinning (cf. 3.2). The younger stage, characterised by the Z.POST-EM. assemblage, exhibits again a dominance of fish and mammals *versus* reptiles and birds. However, fish remains are proportionally less abundant than in the older assemblage and we therefore assume that this source of proteins was less important in the diet of this population. In contrast with the older fish menu, catfishes (*Bagrus*, *Clarias*) are now dominating (ca. 75 %, Table 3), followed by tilapias and *Barbus*. Hunting focused again on topi and hippo, and to a lesser extent on warthog, oribi, bohor reedbuck, eland, a few other

antelopes and buffalo. Other game animals that were added occasionally to the hunter's bag are bushpig, marsh cane rat, dassie, zebra and rhinoceros, together with some carnivores and a medium sized monkey.

4.2. Fishing and hunting methods

Direct evidence for some of the fishing and hunting methods is available only for the Ishango civilisation. It consists of numerous harpoon- and a few spearpoints made of bone. As already stated, the morphology of the bone harpoons led to the subdivision of the older deposits into three developmental stages, i.e. from biserial multibarbed harpoons towards uniserial ones with fewer barbs. The difference between spears and harpoons is that the first are fixed firmly on a wooden shaft. The second are fixed on a rod and hurled into the water, where, if the cast is successful, the barbed tip is released from the rod and remains embedded in the fish. Therefore, one end of the line, at Ishango presumably made of a vine, is tied to the harpoon point, while the other end is held by the thrower.

Both spears and harpoons have been used frequently for fishing during prehistoric and later times (cf. KRAUSE, 1904; GRUVEL, 1928; von BRANDT, 1984). Fish spears are generally used in shallow waters, whereas harpooning is also done on the edge of or in deeper parts of rivers and lakes. Both techniques can be carried out while standing on a fixed point, for example a cliff, a tree etc, or while wading through the water. Harpoons, and occasionally very long spears, are also used to fish from dug out canoes. So far, however, any form of evidence for the manufacturing of boats at prehistoric Ishango is lacking.

The spearing of fish occurs on sight in clear waters, or in waters where the position of the fish is given away by a movement of the vegetation. By stabbing blindly into weedy shallows, reed beds or muddy bottoms, poorer results are generally obtained, unless large numbers of people are involved (cf. BLOSS, 1945; BRELSFORD, 1946 : 68; STUBBS, 1949). Among the species caught with fish spears are members of the genera *Polypterus*, *Clarias*, *Heterobranchus*, *Bagrus* and *Tilapia* (cf. LOAT in BOULENGER, 1907 : xlviii; WORTHINGTON, 1929 : 14; BRELSFORD, 1946 : 68; GOSSE, 1961; GROVE, 1966). With harpoons, members of the genera *Distichodus*, *Clarias*, *Auchenoglanis*, *Bagrus*, *Malapterurus* and *Tilapia* are frequently taken (cf. WORTHINGTON, *ibid.* : 13; GOSSE, *ibid.*).

Apart from the spears and harpoons, we may expect that other fishing gear has been used by the Ishango fishermen. In association with harpoons and spears, present-day fishing tribes in Africa still use bow and arrow, baskets, weirs, nets, clubs etc. (cf. BOULENGER, 1901; LETH & LINDBLOM, 1933; BELL-CROSS, 1974). These fishing implements are made of fibres such as sedges, reeds and papyrus or with shrubs and wood. Unfortunately, the preservation chances of these organic materials are very low. Fishing may also have been done by hand, with or without the aid of ichthyotoxic plant products (see, among others,

Table 14 : Dietary contribution of the mammals from the major levels at Ishango, expressed in kg live weight and in percent.

Stratigraphical level	N.F.PR.			Z.POST-EM.	
	Mammalian species and/or groups	Live (1) Weight	Total Live Weight (2)	Total LW in percent	Total Live Weight
Medium sized monkey	5	15	0.004	10	0.005
Total Primates	-	15	0.004	10	0.005
Hare	2	52	0.015	-	-
Total Lagomorpha	-	52	0.015	-	-
Marsh cane rat	7	133	0.038	21	0.011
Porcupine	20	-	-	20	0.010
Marsh cane rat/porcupine	10	-	-	10	0.005
Total Rodentia	-	133	0.038	51	0.026
Jackal	9	18	0.005	-	-
Cape hunting dog	20	-	-	20	0.010
Spotted-necked otter	5	30	0.009	-	-
Clawless otter	20	40	0.011	-	-
Medium felid	10	10	0.003	-	-
Lion	150	150	0.043	150	0.077
Small carnivores	1	1	+	2	0.001
Medium carnivore	4	-	-	4	0.002
Total Carnivora	-	249	0.071	176	0.090
Aardvark	65	195	0.056	-	-
Total Tubulidentata	-	195	0.056	-	-
Dassie	3	-	-	3	0.002
Total Hyracoidea	-	-	-	3	0.002
Rhinoceros	2 000	2 000	0.573	2 000	1.021
Zebra	275	275	0.079	275	0.140
Total Perissodactyla	-	2 275	0.652	2 275	1.161
Total Suids	-	3 170	0.908	1 680	0.857
Bushpig	80	240	0.069	80	0.041
Warthog	100	1 000	0.286	700	0.357
Bushpig and/or warthog	90	1 530	0.438	900	0.459
Giant forest hog	200	400	0.115	-	-
Hippopotamus	2 000	192 000	55.007	122 000	62.259
Total small wild bovids	-	855	0.245	600	0.306
Oribi	15	75	0.022	75	0.038
Small wild bovids	15	780	0.223	525	0.268
Total medium wild bovids	-	7 265	2.081	5 450	2.782
Bushbuck	50	550	0.158	300	0.153
Sitatunga	65	65	0.019	-	-
Tragelaphine antelopes	50	200	0.057	400	0.204
Bohor reedbuck	50	1 300	0.372	1 300	0.664
Kob	80	-	-	400	0.204
Reduncine antelopes	50	300	0.086	400	0.204
Medium wild bovids	50	4 850	1.389	2 650	1.352
Total large wild bovids	-	97 160	27.836	43 230	22.061
Topi	120	1 320	0.378	840	0.429
Alcelaphine antelopes	120	26 160	7.495	11 160	5.695
Waterbuck	200	800	0.229	400	0.204
Greater kudu	220	440	0.126	-	-
Roan antelope	250	2 500	0.716	500	0.255
Large wild bovids, mainly topi	120	57 840	16.571	26 280	13.411
Large wild bovids, other than topi	225	8 100	2.321	4 050	2.067
Total very large wild bovids	-	43 400	12.434	18 200	9.287
Eland	600	13 200	3.782	3 600	1.837
African buffalo	650	-	-	10 400	5.307
Giant buffalo	800	12 000	3.438	-	-
Very large wild bovids	650	18 200	5.214	4 200	2.143
Unclassified bovids	120	2 280	0.653	2 280	1.164
Total Artiodactyla	-	346 130	99.164	193 440	98.716
Totals	-	349 049	100.000	195 955	100.000

(1) Live weights are based on data in HALTENORTH and DILLER (1979) and KINGDON (1971-82).

(2) Total live weights are calculated with the fragment counts given in table 6.

LABOURET, 1931; GOSSE, *ibid.*).

In contrast with the older deposits, direct evidence for fishing equipment is completely lacking for the Z.POST-EM. assemblage. This does not necessarily imply that the techniques of fish spearing and harpooning were lost. Indeed, other raw materials may have been used for the manufacturing of these weapons. WILVERTH (*in* BOULENGER, 1901 : XXXI), for example, mentions that wooden harpoon points are used by natives in northern Zaire to kill large fish in the Kwango river, while KRAUSE (1904 : 29) notes that wooden spears are used for fishing all over Africa. JACKSON (1923) relates that as late as the early twenties, the Nuer "... made spears of the horn of an antelope such as topi, kob, waterbuck, roan and Nile lechwe. The horn was softened in water and straightened out until it formed an interesting though primitive weapon ...". Such implements as those described may have been used for fishing at Ishango, unfortunately without leaving a trace in the archaeological record because of their organic nature. However, the lower frequency of fish remains in the Z.POST-EM. assemblage suggests that fishing was less important than during the older stage.

Hunting focused mainly on terrestrial vertebrates, though a number of (semi-)aquatic reptiles, birds and mammals were also taken. During the older stage, it is possible that harpoons and spears have also been used to kill Nile monitor, marsh cane rat, spottednecked otter, clawless otter, and maybe hippopotamus. Spears, made of various raw materials, may have served for killing small to large terrestrial vertebrates, as is still the case today. Also, other hunting techniques were no doubt used by the Ishango inhabitants. Among the most widespread and hence most likely hunting devices are bow and arrow (with or without poison), snares, traps and nets (*cf.* KELLER, 1936). At Ishango, the use of non-selective hunting gear to hunt topi can probably be deduced from the age pattern of the dental material. The N.F.PR. sample is dominated by remains of immature animals; prime age animals are well represented, but very old animals are nearly absent. Such an age pattern compares very well with the one observed in a free living topi herd, and we therefore assume that the hunting of these antelopes occurred at random, indicating a non-selective hunting method such as snaring or trapping. Large animals such as hippopotamus may have been captured by digging pits on their paths or landing places (*cf.* TITHERINGTON, 1927).

To conclude, a number of techniques may have been used to hunt at Ishango, but direct evidence remains very scarce for the moment.

4.3. Place of capture and collecting

Species are characterised by typical ecological requirements and are hence environmental indicators. These ecological requirements give us a clue as to the place of capture or collecting of the species involved. Thus, most of the freshwater molluscs, found at Ishango, are inhabitants of lakes, rivers and swamps.

Consequently, if they have been collected by prehistoric man, than they were most likely gathered near the edge of the lake of the Semliki or in some of the swampy areas nearby. As to the fish, it is clear that both the Semliki and the lake may have served as fishing grounds. However, we do not know whether all the facies of these waterbodies were accessible to Ishango man. So far, evidence for the use of boats is lacking and we may therefore assume that the deeper parts of the lake and even of the Semliki were not exploited.

In many fluvial systems in Africa, it is known that the flood regime of rivers and lakes causes a seasonal expansion and contraction of water area. When the floodwaters arrive at the beginning of the rainy season, a considerable area adjacent to a lake or major river may be flooded. During the dry season, 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 hydrological cycle, a lateral migration of the fish inhabiting the main waterbodies occurs and both adults and newborns benefit from the mass of food and shelter available in the shallow flooded areas (DAGET, 1954 : 21-23). As the plain dries out, most of the fish leave the floodplain, but part of the community remains in the standing waters, including, for example, members of the genera *Polypterus*, *Protopterus*, *Clarias*, *Heterobranchus*, *Auchenoglanis*, *Synodontis* and *Tilapia* (DAGET, *ibid.*; GREENWOOD, 1955-57). The major fishing activities in such circumstances take place at the beginning of the flooding phase, and towards the end of the dry season, when the remaining pools, lagoons etc. become accessible (WELCOMME, *ibid.* : 260-261; GAUTIER & VAN NEER, 1989).

At present, we are not aware of such seasonal flooded areas in the Ishango region, but their existence during prehistoric times is not inconceivable : (1) Geological research in the area has demonstrated that at the time Ishango was inhabited, the level of the lake was considerably higher than today; since then, the lake level has sunk about 10 m (de HEINZELIN, 1955, 1957); (2) In the mammalian fauna, two antelopes are well represented, the topi and the bohor reedbuck. Topi are characteristic for floodplain and swamp grassland, while bohor are partial to the channels on floodplains where their favourite pasture can be found (VESEY-FITZGERALD, 1960; SMITHERS, 1983 : 618). The relative abundance of these antelopes in the Ishango assemblages suggests that they were the most abundant and easy obtainable game at Ishango and indicates that their ecological requirements were largely met within the area during prehistoric times. Presently, topi and bohor occur only sporadically in the region, the nearest area where they are abundant being the Rutshuru plain south of the lake (ROBYNS, 1948); (3) Today, fishing equipment such as harpoons and spears is still frequently used for floodplain fishing; (4) The existence of seasonally flooded areas near Ishango during earlier times is not contradictory to the composition of the fish fauna. Indeed, most of our species are known to partake into the lateral migrations

when the floodwaters arrive (cf. VAN NEER, 1982; 1986; GAUTIER & VAN NEER, 1989). The only exception may be the Nile perch, *Lates niloticus*, of which the large adults are said to remain in the open and deeper water. The size of the individuals represented in the N.F.PR. sample is estimated to range from 30 to 100 cm standard length, with distinct modes at ca. 40 and ca. 65 cm (GREENWOOD, 1959 : 51-52). In the present day Nile and in Lake Mobutu, however, the largest Nile perch run to nearly 2 m in length and 120 kg in weight (WORTHINGTON, 1929 : 9; SANDON, 1950 : 53). Our sample consists clearly of the smaller perches. Therefore, it is not excluded that these fish were caught in the deeper floodplain channels. MOLLOY (1956 : 58-59) notes that in the southern Sudan, Nile perch, tilapia and a dozen other species were caught in a khor that was drying out in a string of pools.

To summarize, it can be safely assumed that most fishing activities were practised in the littoral zone and along the margins of the lake, in the shallow parts and along the margins of the Semliki, in the swamps and marshes adjacent to the river and in seasonally flooded areas, if these existed.

According to their habitat requirements, we can arrange the reptiles, birds and mammals in four groups. The habitat requirements of the most important mammalian species are given in Fig. 4. The requirements of the species involved suggest *grosso modo* that four types of habitats were present near Ishango : (1) The margins of the lake and the Semliki, bordered with papyrus, reeds, sedges and other aquatic plants, and the nearby marshes, lagoons, pools etc., where Nile monitor, marsh cane rat, spotted-necked otter, clawless otter, bushpig, hippopotamus, sitatunga and bohor reedbuck were most likely encountered. To these, we can probably add many fish-eating birds, such as herons, egrets, cormorants,

darters, storks, pelicans and fish eagle. These birds are attracted by concentrations of fish that may occur in marshes or pools (cf. BELL-CROSS, 1974) and may have been killed by man when they interfered with his fishing activities (cf. GAUTIER & VAN NEER, 1989); (2) Gallery forest or perimeter woodland along the Semliki, with thickets and a well developed underbush may have served as hunting ground for marsh cane rat, clawless otter, bushpig, giant forest hog, bushbuck and greater kudu; (3) Woodland zone between the gallery forest and the open grasslands, which may have been a suitable habitat for francolins, giant forest hog, bushbuck, greater kudu and probably eland; (4) The open grasslands with termitaria and small stands of trees and shrubs, stretching from the lake border up to the hills, including the lake shore, the floodplain, the perimeter and other grasslands. Animals most likely caught in this area are lion, aardvark, zebra, rhinoceros, warthog, hippopotamus, oribi, reedbuck, kob, topi, waterbuck, roan antelope, eland, African and giant buffalo.

Finally, certain terrestrial birds such as vultures or the white-necked raven have no specific habitats; preferences but feed on carrion. At Ishango, the left-overs of the site inhabitants may have attracted these birds, which consequently may have been killed in the vicinity of the site.

The foregoing subdivision suggests that during prehistoric times, hunting at Ishango focused on animals that frequented the open grasslands stretching from the lake shore up to the hills.

4.4. The annual cycle at Ishango : some considerations

Present-day hunter-gatherers rely often upon a broad spectrum of food resources. Typical for them is the effectiveness with which they exploit these different resources, and this is directly related to their practical knowledge of the ecological requirements, habits and life cycles of these resources. This implies often that a kind of annual round has to be performed, in which the different resources are visited at the best moment(s) of the year. In the next paragraphs, we will try to evaluate at which moment or during which season Ishango was an interesting place for people to live, and therefore most likely occupied. As stated earlier, evidence for food items such as vegetables, fruit, honey, insects etc. is completely lacking in the Ishango deposits. Hence our reconstruction relies exclusively on the vertebrates, found in the collections.

Today, Ishango lies within an area receiving a mean annual precipitation of some 1200 mm, but the minimum and maximum amounts of rain may vary between 900 and 1500 mm (BULTOT, 1971). The actual rainfall pattern makes it possible to distinguish two dry and two wet seasons : a (shorter) dry season from mid-December to February, a (shorter) wet season from March to May, a second (longer) dry season from June to August, and a second (longer) wet season from September to mid-December. If the rain patterns in the past were comparable with those prevailing today and if the amount of precipitation during the wet season was

Fig. 4 : Habitat preferences of important mammals found in the Ishango deposits (partly after LAMPREY, 1963).

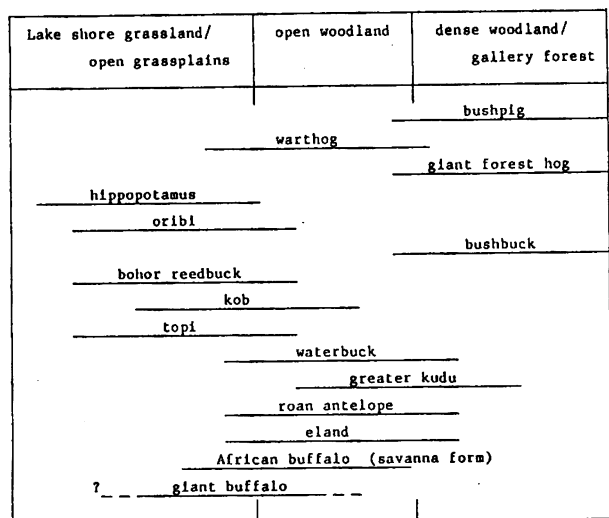


Table 15 : Inter-site comparison of anatomical segment distributions of some important fish genera

Sites and levels	Ishango(1)				Khashm-el Girba(2)		Wadi Kubbania			
	N.F.PR.		Z.POST-EM.		KG-68		KG-14		All levels(3)	
	n	%	n	%	n	%	n	%	n	%
Fish genera and anatomical segments										
<u>Barbus</u> and/or <u>Labeo</u> : Syncranium + pectoral girdle	1 371	54.2	6 12.8		- -	- -			43	15.4
Axial skeleton	686	27.1	41 87.2	24 82.8	270 100.0				187	67.0
Fin skeleton	472	18.7	- -	5 17.2	- -				49	17.6
<u>Clarias</u> and/or <u>Heterobranchus</u> : Syncranium + pect. girdle	837	93.0	130 78.8	318 87.4	78 90.7	81 726	97.4			
Axial skeleton	63	7.0	35 21.2	46 12.6	8 9.3	2 214	2.6			
Fin skeleton	-	-	- -	- -	- -					
<u>Synodontis</u> : Syncranium + pectoral girdle	768	87.4	14 93.3	- -	199 77.1					
Axial skeleton	6	0.7	- -	- -	15 5.8					
Fin skeleton	105	11.9	1 6.7	- -	44 17.1					
<u>Lates</u> : Syncranium + pectoral girdle	340	52.4	- -	13 25.0	52 17.7					
Axial skeleton	209	32.2	- -	27 51.9	207 70.4					
Fin skeleton	100	15.4	- -	12 23.1	35 11.9					
<u>Tilapiini</u> : Syncranium + pectoral girdle	33	4.0	5 3.7	4 11.1	- -	1 230	16.4			
Axial skeleton	362	43.7	76 55.9	11 30.6	59 57.3	2 812	37.5			
Fin skeleton	433	52.3	55 40.4	21 58.3	44 42.7	3 451	46.1			

(1) Based on the faunal lists published by GREENWOOD (1959)

(2) Based on data, summarised by VAN NEER (*in* PETERS, 1986a, Bijlage 4)

(3) Information obtained from the manuskript on the faunal remains from Wadi Kubbania (GAUTIER & VAN NEER, 1989)

sufficient to cause an appreciable expansion of the lacustrine and fluvial realm at the expense of the lake shore grasslands, than fishing at Ishango may have been especially rewarding at the beginning of the longer wet season and towards the end of the following short dry season, i.e. during September and from mid-January to the beginning of March. Fishing activities may also have been intensified in February, June and December, because then, according to de HEINZELIN (1957 : 59), huge clouds of insects (genus *Corethra*) concentrate above the lake surface to exuviate. Large amounts of exuviae collect on the surface and become mixed with algae. Whole groups of fish are attracted by this soup, which in turn are followed by other predatory fishes. The Ishango inhabitants were no doubt aware of these favourable fishing conditions, and perhaps they exploited them whenever possible. FÜLLEBORN (1906 : 112) mentions that during this period of great abundance of insects not only the fishes, but also the insects and their exuviae are collected and consumed by natives of Lake Nyassa.

Hunting activities can be expected taking place all year round. However, the range of species killed may vary with the season. Many herbivores are known to disperse during the wet season, because new pasture becomes available. Certain antelopes, on the contrary, aggregate in specific areas during this period. Topi, for example, move onto the perimeter grasslands as soon as the rain starts; later on, they concentrate on the remaining patches of dry ground at the edge of the floodplain (VESEY-FITZGERALD, 1960). Bohor reedbuck, on the other hand, frequent the channels on the floodplain and remain there during the rains, resorting to areas of

shallower flooding. A comparable behaviour is noted in the lechwe (*Kobus lechwe*) that inhabits the Bangweulu swamps. Here, the big lechwe drives take place in April and May when the high water following the rains has packed the lechwe on the southern plains (BRELSFORD, 1946 : 129). The animals are driven into the water and killed with spears. A comparable hunting method may have been practised at Ishango to kill bohor.

It is likely that during the dry season a broader spectrum of animals was hunted, because many species make predictable daily movements to and from points with surface water. According to the strategy used to keep the water balance equilibrated during the dry season, VESEY-FITZGERALD (*ibid.*) was able to divide the Rukwa plain herbivores into shadders and drinkers. Bohor, topi and eland appear to be shadders by preference, and tend to frequent green pasture in the vicinity of trees where they have no access to surface water. Buffalo, zebra, hippopotamus and kob are essentially drinkers and frequent the riverine pastures on the open plains. Thus, traps, snares and pitfalls near stands of trees and shrubs and on paths leading to the river or to the lake very likely provided Ishango man with a broad spectrum of game.

We may conclude that, if the seasonal variations in rainfall were outstanding enough to cause an appreciable expansion of the water area and hence migrations of both fish and terrestrial vertebrates, both fishing and hunting may have been of varying importance throughout the year. A model with primarily fishing at the beginning of the wet season, increased hunting activities when the water has reached its

highest level, again focusing on fishing during and towards the end of the dry season, and finally hunting as a major activity at the end of the dry season, appears the most acceptable for the moment. Whether Ishango was occupied all year round cannot be deduced from the available archaeozoological data. However, if an expansion of the water area coincided with the longer wet season Ishango may have been a favourable spot to live from the end of August till the beginning of March. Indirect evidence for an occupation of the site during (part of) this period comes from the small bird bone collection, which yields remains of two Palaeartic winter visitors, the whimbrel (*Numenius phaeopus*) and the lesser black-backed gull (*Larus fuscus*).

4.5. Fish and meat processing

The analysis of the frequencies of the body parts by which the different species are represented may provide insights into the way animals have been processed and utilised by prehistoric people. For this purpose, we lumped the various skeletal elements of the major animal groups into rough anatomical units, which are chosen in a way that they may reflect techniques of processing and preparation, or introduction of selected body parts at the site etc.

The fish remains have been subdivided roughly into three anatomical units (cf. VAN NEER, 1986; GAUTIER & VAN NEER, 1989), i.e. skull bones (= syncranium + pectoral girdle), axial skeleton and fin skeleton (Table 15). From this, it is observed that the Ishango material exhibits a few trends: (1) skull bones from clariids are very abundant, while the axial skeleton is poorly represented and fin skeleton elements are completely lacking; (2) In *Synodontis*, skull bones are abundant, dorsal spines well represented and vertebrae nearly absent; (3) the low number of skull bones in Tilapiini, proportionate to the axial and fin skeleton; (4) The dominance of head elements and the low number of vertebrae in Cyprinids (*Barbus/Labeo*) and in *Lates* within the N.F.PR. assemblage.

We compared the body part frequencies from Ishango with those obtained in two eastern Sudanese early Holocene sites (VAN NEER, in PETERS, 1986a) and in several terminal Pleistocene sites from southern Egypt (GAUTIER & VAN NEER, 1989). From these, it can be seen that the first three trends, found at Ishango, are also observed elsewhere. Most likely, the intraskeletal distribution of the Ishango fish bones is merely the result of natural processes such as differential preservation, the number of elements in a species's skeleton, selective sampling and 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; GAUTIER & VAN NEER, *ibid.*). The differences in intraskeletal distribution in Cyprinids and in Nile perches from the N.F.PR. assemblage versus those observed in the other collections cannot be unequivocally explained. Yet it is not inconceivable that these differences are the result of decapitation, followed by a selective removal of

the remaining part of the fish for consumption elsewhere.

As to meat processing, we will focus on the intraskeletal distribution within the different wild bovid classes, as wild bovids form a major resource for Ishango man. This may provide some insight in what happened with the animals after they had been killed. For this purpose, we lumped the various skeletal into seven units: (1) the skull, teeth, atlas and axis; (2) the upper fore limb, from scapula to radius-ulna; (3) the carpus and metacarpus; (4) the pelvis; (5) the upper hind limb, with femur, patella, tibia and malleolus; (6) the tarsus and metatarsus, and (7) phalanges. The Ishango body part frequencies are compared with those obtained from other African sites: Klasies River Mouth, Cave 1 (South Africa, MSA; KLEIN, 1976; BINFORD, 1984), Matupi Cave (Northeast Zaire, LSA to Iron Age; VAN NEER, 1981), Border Cave (South Africa, MSA and LSA; KLEIN, 1977), Buffelskloof (South Africa, LSA; KLEIN, 1978), Khashm-el Girba KG-73 and KG-23B (Eastern Sudan, LSA and Mesolithic; PETERS, 1986a) and Kiantapo (South Zaire, Iron Age; VAN NEER, *ibid.*). The studies by VAN NEER and PETERS are based on specimen counts, those by KLEIN include only MNI-counts.

Although the Ishango small and medium bovid samples are relatively small, it is noted that a comparison between them and those obtained elsewhere reveals some parallels: (1) a high proportion of the bone material consists of cranial, upper fore limb, upper hind limb and lower hind limb bones, indicating that most of the skeleton is represented; (2) the proportions of carpals and phalanges tend to fluctuate considerably. The first trend is most likely due to pre- and postdepositional processes, sample size and sampling bias; the second is often related to sampling bias. We illustrate this with two examples. At Matupi cave, most bone material is derived from pits near the entrance of the cave, where it can be expected that trampling was more intensive than at other loci. Sampling was done by wet sieving with a mesh of 5 mm and hence the bone sample produced a high proportion of smaller elements such as teeth, carpals, tarsals and phalanges. At Klasies River, a preliminary sorting of the faunal remains took place in the field, and all bones which were considered unidentifiable were discarded. BINFORD (1984: 134) adds that sieving was done with 1/2 inch (= 12.7 mm) screens. Thus a lot of smaller identifiable bones were lost.

The large and very large wild bovids are dominated by cranial, lower fore limb and lower hind limb bones, and phalanges. The somewhat lower frequencies of the upper limb bones are probably related to the fact that these are broken for the extraction of marrow, which render them less recognisable than their homologues in small and medium wild bovids. The high frequency of smaller skeletal elements at Matupi and the low one at Klasies are, according to us, again the result of sampling. The fact that at Ishango the very large wild bovid class exhibits a low frequency of carpals may be due to the small sample size. We note that within this bovid class, the giant buffalo is present in Ishango,

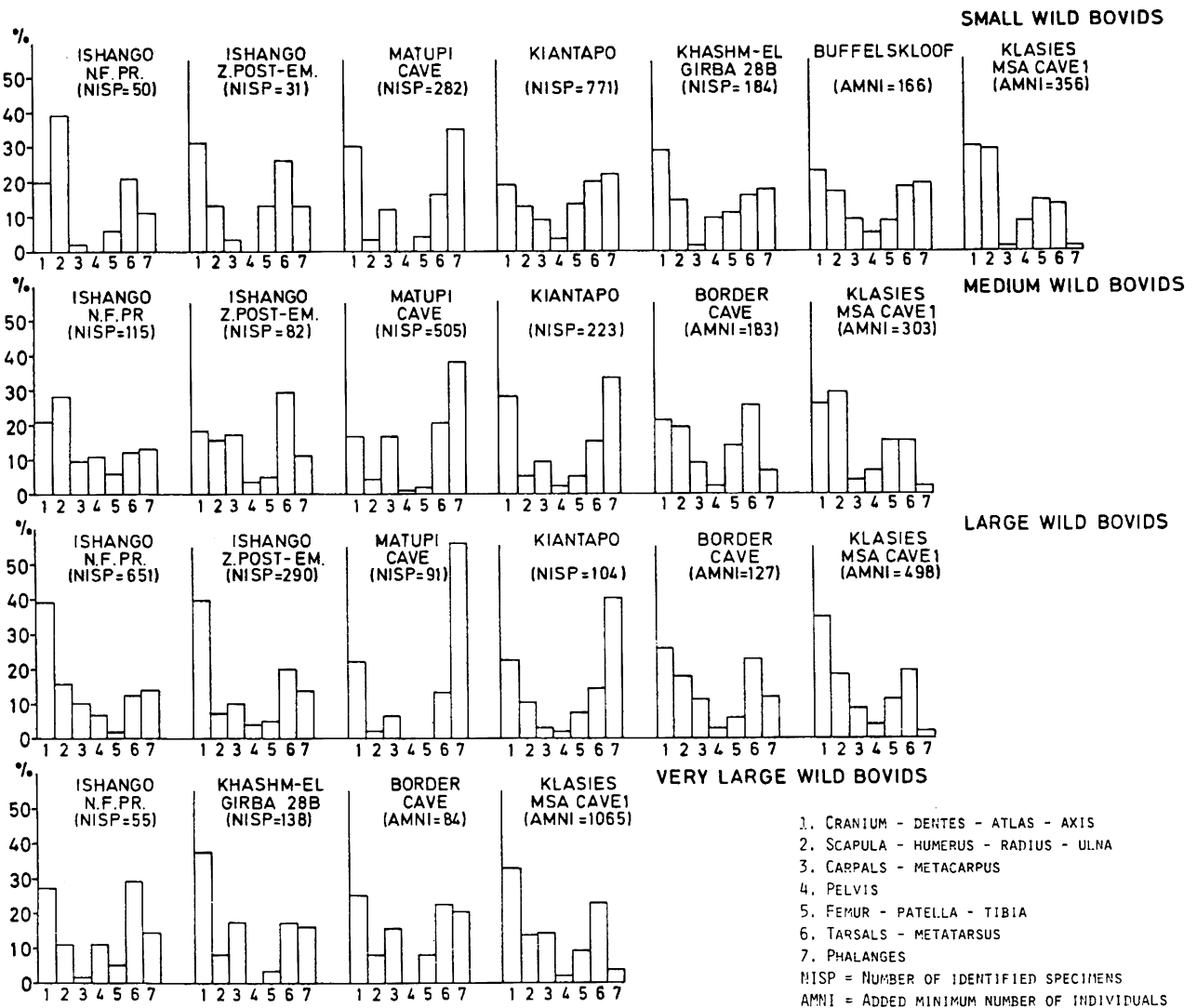
Border Cave and Klasies River. In KG-73 this species is replaced by a similar sized animal, the aurochs (*Bos primigenius*). Remarkably enough, the body part frequencies observed match very well with those obtained at the other sites.

If we take into account sampling bias, sample size and differences in quantification methods, one major trend can be retained, namely small and medium wild bovids are represented by more complete skeletal inventories than are large and very large wild bovids; also, the larger the animal, the more likely it is represented by head and lower limb bones, and phalanges. How can this observation be explained? KLEIN (1976) interpreted these intraskeletal differences in terms of what PERKINS & DALY (1968) have called the "Schlepp-effect". These authors postulate that hunters were likely to bring home smaller animals intact, but that they probably would bring back only selected parts of larger animals. The latter would be butchered at the kill site and the less useful parts would be left there. In

documenting the operation of the "Schlepp-effect" at the early Holocene site of Suberde in Turkey, PERKINS & DALY showed specifically that larger bovids tended to be represented disproportionately well by footbones in comparison with leg-bones. They therefore postulated that the Suberde people discarded many larger bovid limb bones at the kill sites but brought back the feet either as handles in the skins, or because the feet were particularly valued. According to KLEIN, one or the other explanation would also be valid for the Klasies River Mouth site.

More recently the Klasies assemblage has been re-interpreted by BINFORD (1984 : 97, 175, etc). To cut a long story short, this author suggests that the Klasies hominids were probably killing small wild bovids, but were generally consuming the choice parts at the kill site. Hence complete individuals were seldom brought to the site, and than normally minus the lower legs. As to the large and very large bovids, the parts most commonly introduced at the camp were the

Fig. 5 : Inter-site comparison of body part distributions of small, medium, large and very large wild bovids.



marrow-yielding lower and other parts of marginal utility such as the neck. BINFORD concludes that the most economical as well as the best-informed interpretation would simply be that the Klasies hominids systematically scavenged the carcasses of the larger ungulates. This scavenging consisted of recovering parts with usable meat when possible, and generally took place after the other predators had completed their feeding on the carcass.

The weakness of the interpretations by KLEIN and BINFORD lies in the fact that they are based on the intraskeletal distribution within one faunal assemblage only, and this without considering sampling and various types of taphonomic bias not resulting from prehistoric man's behaviour. Because the Klasies sample is a biased one, resulting in an underrepresentation of smaller skeletal elements, BINFORD's interpretation that complete small ungulates were only rarely introduced at the site, generally without the lower legs, must be rejected because of the sampling bias against these "missing" elements.

As to the larger ungulates, KLEIN's suggestion that a kind of "Schlepp effect" might be involved cannot be entirely ruled out. However, sieving experiments by PAYNE (1975) have demonstrated that poor recovery may produce a "pseudo-schlepp effect". Also, if a form of selection occurred at the kill site, we wonder why so many skull fragments were found at Klasies, keeping in mind the low nutritional value of this (heavy) body part. BINFORD's explanation, however, that the large ungulate skeletal part distribution at Klasies would be the result of scavenging is even a less valuable alternative. This author argues that such a scavenging behaviour would be related to the inability of the Klasies people to hunt larger animals, and this would be due to the fact that their technology was not advanced enough to enable elaborate hunting practises. Remarkably enough, comparable large ungulate body part patterns are found in many African Late Stone Age to Iron Age sites (Fig. 5). We find it difficult to believe that all these civilisations, sometimes clearly illustrating an advanced technological level, relied on scavenging for their meat supply, and hence have no particular reason to adopt BINFORD's hypothesis. The large ungulate scavenging model of BINFORD is also discounted by KLEIN (1986b), who correctly points to the fact that the age profile of the Klasies eland with its abundant prime-age adults is contradictory to the one that can be expected when people are relying on carnivore kills for their meat.

The foregoing illustrates that no interpretation of intraskeletal distributions can be made without comparing them with distributions observed at other sites. The fact that more or less similar body part patterns are observed within different assemblages leads us to the assumption that mainly pre- and postdepositional processes, differential preservation, sampling bias and the *facteur de reconnaissance* can be considered the major causes for the observed discrepancies. Long bones of smaller ungulates may be more easily recognised, partly because they are less frequently destroyed by man and partly because trampling may break them, but leave parts of them still recognisable. On the other hand, long bones of larger ungulates, once fragmented through natural or human

activities may become less recognisable and are hence less easily identified.

5. PALAEOECOLOGY AND PALAEOCLIMATOLOGY

5.1. Present-day topography, climate, vegetation and fauna at Ishango

Ishango lies in the Upper Semliki plain which consist of a flat to slightly undulating country, with clearcut cliffs at the border of the lake where it exits in the Semliki. At Ishango, the altitude of the plain is about 910 m above sealevel. Further to the north, this altitude diminishes to some 750 m near the Puemba river. To the east and the west, the Upper Semliki plain is bordered by mountains up to 2300 m (Fig. 1 & 2).

According to the maps given in BULTOT (1971), the Lake Rutanzige area receives on average 1200 mm of rain annually. The annual precipitation is sufficient to maintain different types of vegetation near Ishango, namely an aquatic vegetation with associations of *Phragmites*, *Papyrus* and *Phoenix* species at the border of the lake, the lake shore grassplains followed by an open grassland with stands of trees and shrubs (*Acacia*, *Capparis*, *Erythrococca* and *Euphorbia*, a gallery forest at the borders of the Semliki and a few affluent rivers, and finally some concentrations of *Euphorbia* and *Olea* trees intertwined with lians in some of the ravines (ROBYNS, 1948).

The present-day fauna near Ishango is still quite rich, though a number of species encountered in the fossil deposits have never been recorded alive recently. Among the molluscs we cite *Cleopatra bulimoides*, *Aspatharia rubens*, *Etheria elliptica* and some smaller gastropods (cf. MANDAHL-BARTH, 1954; ADAM, 1957; VAN DAMME & GAUTIER, 1970). According to GREENWOOD (1955-57), the modern fish fauna of Lake Rutanzige consists of members of the genera *Protopterus*, *Mormyrus*, *Labeo*, *Barbus* (incl. *B. altianalis*), *Bagrus*, *Clarias*, *Amphilius*, tilapias and some smaller cichlids and cyprinodonts. The genera *Polypterus*, *Synodontis*, *Heterobranchus*, *Claroetes*, *Lates* and the barbel *B. bynni* are absent from the lake at present, though *Synodontis schall* is recorded from the northern Semliki (PERCY & RIDLEY, 1955).

The other vertebrates encountered nowadays near Ishango have, with a few exceptions such as the elephant (*Loxodonta africana*), all been recognised in the bone samples. On the other hand, clawless otter, greater kudu and eland have never been observed in the area (FRECHKOP, 1938, 1943; ROBYNS, 1948).

5.2. The Ishango civilisation

The fossil faunas, related to the Ishango culture, form a rich assemblage (Table 6). As stated above, the accumulation of mollusc shells is most likely the result of natural processes, whereby shell debris has been added to the kitchen refuse. Most of the species have a wide ecological range, and no specific ecological conclusions can be drawn from this assemblage. GREENWOOD (1959 : 71) described the fish fauna associated with the Ishango culture as a segment of the

modern Lake Mobutu because of its more complete nilotic facies. Indeed, the bone sample is dominated by members of the genera *Barbus*, *Synodontis*, *Clarias*, *Lates* and by tilapias. About 70 % of the bones are derived from fish that are absent in the lake and in the Upper Semliki nowadays, namely *Barbus bynni*, *Synodontis frontosus*, *Synodontis schall* and *Lates niloticus*. The composition of this fauna suggest that the water of the lake and of the Semliki was well oxygenated, because this is an important requirement in decreasing order for *Lates*, *Synodontis* and *Barbus* (FISH, 1956; VAN NEER, 1986; GAUTIER & VAN NEER, 1989). The oxygen requirements of tilapias and *Clarias* are considerably lower. Because of the dominance of the first group, it may be assumed that the fishing grounds of the Ishango inhabitants had a good water quality, a point to which we will return later.

The reptilian and avian faunal remains do not provide us with specific ecological information. However, most of them often occur in the vicinity of large waterbodies. Therefore, a large segment of these vertebrates can be considered an alluvial plain community (cf. BELL-CROSS, 1974; SERLE *et al.*, 1977).

The mammalian fauna reflects a broad spectrum of habitats near prehistoric Ishango. As we know, the species most frequently caught are topi and bohor reedbuck; they are typical for seasonal inundated grasslands. Most of the other herbivores are almost exclusive grazers, a fact reflected in their habitat preferences (Fig. 4). The habitat requirements of the giant buffalo are not well known. However, its hypsodont teeth and long horns indicate a preference for open grasslands (KLEIN, 1980). This is confirmed indirectly by faunal studies in South Africa : fossil remains of giant buffalo from Late Pleistocene sites are generally associated with bones of typical grazers, including the extinct Cape zebra (*Equus capensis*), the extinct giant hartebeest (*Megalotragus priscus*), black wildebeest (*Connochaetes gnou*) and Bond's springbok (*Antidorcas bondi*) (KLEIN, *ibid.*; BRINK, 1987).

Apart from the grazing species, the Ishango horizons also contain remains from a few almost exclusive browsers, such as bushbuck and greater kudu, and some mixed feeders : bushpig, giant forest hog, eland and waterbuck (Fig. 4).

The terrestrial vertebrates of the older assemblage are actually inhabitants of the dry savannas *sensu* MÜLLER (1974). These savannas are characterised by an annual precipitation of 500 to 1200 mm. Although the Ishango palaeoenvironment does not differ markedly from the present one, it is not inconceivable that the fauna suggests a somewhat lower mean annual precipitation than today. As said, antelopes frequenting seasonally inundated areas are dominating the assemblage, whereas today they are very uncommon in the region. This may imply that the seasonal climatic changes were more emphasised in prehistoric times i.e. with more pronounced wet and dry seasons, a phenomenon often observed when climatic conditions become drier (WILLIAMS, 1985).

As illustrated in Tables 9 to 13, we compared the measurements of the better preserved Ishango specimens with those obtained on their recent homologues. This revealed that the fossils match with the larger recent individuals or even surpass them in size. The Ishango horizons yielded enough remains to illustrate this phenomenon in four species : marsh cane rat (*Thryonomys swinderianus*), hippopotamus (*Hippopotamus amphibius*), topi (*Damaliscus lunatus*) and bohor reedbuck (*Redunca redunca*). The size range observed suggests that we are dealing with all segments of the respective populations. Hence, a selective hunting of the larger and often more dangerous male individuals can be excluded. One could try to explain the large size of the Ishango animals as due to the good quality of the available pasture, enabling the species to grow larger. GAUTIER (1983c) used this argument to explain the large size of the wild herbivores in an Iron Age site in northern Ruanda, the good quality of the pasture being probably related to the underlying volcanic soils. KLEIN (1984, 1986a) mentions that grysbok (*Raphicerus melanotis*) may grow larger when their preferred food is more abundant and related the bigger size of the fossil population to the increased quantity of browse, which in turn may have been the result of wetter climatic conditions. Examining the modern ungulate fauna of southwest Africa, THACKERAY (1980) has shown that the mean body mass of an ungulate in a community increases along a presumed stability gradient from arid to humid environments. However, COE (1981) argues that larger herbivores may also evolve large body size in response to selection pressures directed at avoiding competition, reducing predation or simply to enable the animals to cover large areas in semi-arid environments in order to obtain sufficient pasture. It should be clear that an interpretation of the large size of the Ishango mammals in terms of quality of pasture is but one possibility.

Another explanation for the observed differences in size can be found in the fact that the hunting pressure on African herbivores during the last centuries, combined with the fact that the actual populations are surviving in less favourable areas, may have influenced the average size of the animals. The smaller size of the specimens that are available in the actual osteological collections may then be related to this bias.

It can also be considered that Bergmann's Rule, according to which the size of homeothermic animals tend to increase along a temperature gradient from warm to cold temperatures, is applicable to our finds. This would mean that, on average, the temperatures were lower at Ishango during prehistoric times. Unfortunately, we have no information on the application of Bergmann's Rule to African herbivores. Also, KLEIN (1986a) argues that herbivores are less likely to obey the rule than carnivores, because variation in temperature is more likely to affect herbivore food supplies : the altered availability of required plant foods may easily outweigh changed temperature as a selective factor on body size.

5.3. The Z.POST-EM. assemblage

The younger assemblage has been deposited at the moment that the lake level was significantly lower than the beaches of the Ishango civilisation (BROOKS & SMITH, 1987). As a result, shell debris is lacking in these deposits. The composition of the fish fauna of the younger level is summarized in Table 3. The genera *Barbus* and *Synodontis* are now of minor importance, while *Lates* apparently has disappeared from the lake. The absence of *Polypterus* and *Heterobranchus* and the slight increase of *Clarias* and tilapias may be related to the smaller sample size. The most striking feature is the amount of *Bagrus* remains since this genus is completely lacking in the extensive N.F.PR. collection; now it makes out about half of the sample. The absence of *Bagrus* in the older deposits can be interpreted in several ways : (1) the species, most likely *B. docmac*, reached the lake after the formation of the older deposits; (2) A small population of *Bagrus* was already present in the lake during the formation of the older deposits, and the disappearance of the predatory *Lates* enabled *Bagrus* to overtake the role of predator; (3) some kind of taboo existed, prohibiting the consumption of *Bagrus* during the older occupation stage. Today, such taboos are recorded for fishes of the genera *Protopterus*, *Mormyrus*, *Heterobranchus*, *Auchenoglanis* and *Barbus* (WORTHINGTON, 1929 : 8; BRELSFORD, 1946 : 38-39); (4) the fishing methods of the earlier Ishango inhabitants were not elaborate enough to catch this fish. However, if *Bagrus* was indeed always present near Ishango, it can be expected that at least a few remains from animals that died naturally, or from animals thrown away when caught, would have been preserved in the extensive older Ishangian samples. Also, the available techniques provided the earlier site inhabitants with many species; this indicates that fishing occurred in several kinds of habitats including those visited by *Bagrus*. Therefore, on the basis of the available evidence, we consider the first explanation the most satisfactory.

As said, *Clarias* and tilapias tolerate relatively low oxygen concentrations. *Bagrus*, on the other hand, is confined to the more open waters that are well oxygenated (GRAHAM, 1928; WORTHINGTON, 1929; GREENWOOD, 1955-57). The abundance of *Bagrus* remains in the younger assemblage would hence indicate a rather good water quality near Ishango during this occupation stage. Yet, it is difficult to believe that the favourable living conditions for *Bagrus* would not apply for *Lates* also. Therefore, the reason for the absence of *Lates* in the Z.POST-EM. deposits must be sought elsewhere.

The mammalian fauna also exhibits a few shifts. Firstly, the giant buffalo (*Pelorovis antiquus*) is replaced by a savanna form of the African buffalo (*Syncerus caffer*). According to SINCLAIR (1977 : 65), savanna buffaloes show a preference for riverine grasslands and riverine forest, the latter being the "ecological refuge" for the animal if competition becomes severe in the first area. In comparison with *Pelorovis*, VRBA (1987) considers *Syncerus* less tolerant of aridity and of vegetationally very open environments. A second important change in the mammalian collection is the appearance of kob

(*Kobus kob*) in the Ishango area. The absence of this highly territorial antelope during the older stage and its presence in the younger assemblage indicate moister climatic conditions enabling the species to establish itself in the riverine grasslands near Ishango.

We conclude that during the Z.POST-EM. phase, open grasslands with some cover under the form of trees and shrubs were still the dominant vegetation type in the area, though kob and buffalo seem to indicate somewhat better climatic conditions.

We notice again some difference in size between the recent museum specimens and the fossil topi, bohor, and buffalo of this level. As discussed earlier, several explanations exist to interpret this phenomenon.

6. THE AGE OF THE ISHANGO CULTURE : THE COMBINED EVIDENCE

Up to now, the age of the Ishango culture could not be established accurately. A radiocarbon age of 21000 years BP (W-283) on shells from the N.F.PR. deposits had to be rejected, because shells from the modern beach produced a radiocarbon age of 3000 years BP (W-284; de HEINZELIN, 1957 : 19, 1962). According to the same author, the contamination of the recent shells could be due to former volcanic activity in the area, upsetting the usual ratio of carbon isotopes. The maximum age of the Ishangian levels was thus estimated at 18000 BP, but with the suggestion that the probable age was closer to 9000-8000 years BP on the basis of the available geological, palaeontological and archaeological evidence.

In 1985, members of the Semliki Research Expedition excavated a 2 m square at the site where de HEINZELIN's two long trenches intersected. This excavation recovered new materials which were used in a series of dating procedures (BROOKS & SMITH, 1987). Shells collected from the Ishangian levels as well as from the modern beach were submitted for dating and produced similar results to those obtained in the early fifties. However, from each sample submitted for radiocarbon analysis, a few shells were retained for analysis of the amino acids in the remaining shell proteins. The preliminary results of this dating procedure confirm a Late Pleistocene age for the Ishango culture. Besides, it could be deduced that the radiocarbon ages of the recent shells were indeed the result of contamination with older carbon in the lake (BROOKS & SMITH, *ibid.*).

To establish the Ishango chronology, information based on sedimentological, archaeological and other analyses has to be considered. Firstly, it was noted by de HEINZELIN (1955, 1957) that the sediments and the archaeological remains in all three levels of the Ishango culture reflect accumulation on the shore of a rising lake. The lake level reached its maximum after the formation of the Ishango horizons : ancient shore lines are observed at ca. 12.50 m above the present lake and these appear to represent the highest lake levels for which there is evidence during the latest Quaternary. Comparable high water levels are known from other African rift lakes for the period considered (see among others, GASSE, 1980; WILLIAMS & FAURE, 1980). A precise dating of this event at Lake Rutanzige is

impossible, but HARVEY (1976, *vide* GASSE, *ibid.*) notes that Lake Mobutu regained its overflow level by 12480 BP, while a 12500 to 10000 BP highstand is also evident in Lake Kivu (HECKY, 1978, *vide* GASSE, *ibid.*). These high lake levels would be related to the wetter conditions that followed the terminal Pleistocene arid phase.

A second important factor that may contribute to establish the Ishango chronology is the relationship between the Ishango deposits and the Katwe eruptions which covered the Upper Semliki region with up to 6 m of ashes. Unfortunately, ash levels are absent at the Ishango site. Mineralogical evidence, however, suggests that volcanism associated with the earlier Ishango horizons was very limited and that the bulk of the Katwe eruption(s) postdate the Ishango culture, or was contemporary only with its final stages (de HEINZELIN, 1962). It has also been observed that the post-Ishangian levels are separated from the underlying deposits by some 25 cm of terrigenous colluvial gravels. This unconformity indicates a period of hill slope erosion to a lake level lower than the beaches of the Ishango civilisation (BROOKS & SMITH, 1987). The absence of an ash cover at Ishango may well correlate with the erosional interval between the older (N.TUF.) and the younger (Zone Brun) deposits. Excavations by the Semliki Research Expedition at Kabale, some 3 km to the north of Ishango, produced a charcoal sample from just above the volcanic tuff in place, with an age of 6890 ± 75 BP (SI-7066). Thus if the Katwe ash postdates the Ishango horizons, the latter cannot be younger than ca. 7000 years BP (BROOKS & SMITH, *ibid.*).

The archaeological assemblage found in the Ishangian levels was interpreted as of early Holocene age on the basis of its technological evolution and of the comparison with "mesolithic" occurrences elsewhere (de HEINZELIN, 1957 : 17-19). However, the same author noted that the lithic assemblage also showed Palaeolithic affinities, but argued that in sharp contrast to the primitive implements, large numbers of grinding and pounding stones are found, pointing to a relatively advanced stage of culture. Such equipment does not necessarily imply a young age for the Ishango culture, because in southern Egypt comparable artefacts have been found in a clear Upper Palaeolithic context dated to the Late Pleistocene (WENDORF *et al.*, 1980). As to the supposedly Palaeolithic characters of the lithic assemblage, VAN NOTEN remarks that the younger part of the lithic assemblage from Matupi Cave, dated from 40000 to 12000 BP, exhibits considerable similarities with the one found in the Ishangian horizons (VAN NEER, 1981, Vol. 1 : 6).

In all previous studies the faunal remains were considered to support, or at least not to refute the age estimates made by their authors. The fact that HOPWOOD & MISONNE (1959) described the fauna as : "... Au point de vue biogéographique, l'ensemble de la faune a plus d'affinités forestières et de lisières de forêts que la faune actuelle, ce qui n'est explicable que par une végétation ligneuse plus dense à l'époque ..." supported the view of de HEINZELIN, i.e. better climatic conditions and hence an early Holocene age for the Ishango civilisation. BROOKS & SMITH (*ibid.*) on the

other hand, while suggesting a Late Pleistocene age for the Ishango culture, state that "... The terrestrial fauna from Ishango neither supports nor refutes this view; red forest buffalo (*Syncerus nanus*) and duiker (*Cephalophus* sp.) could indicate a more forested environment, while topi (*Damaliscus lunatus*) prefer open habitats.

At present, Ishango lies about 70 km from the edge of the equatorial forest and it can be expected that during wetter periods in the past, the forest would certainly have approached the site. Matupi Cave, some 100 km north of Ishango, illustrates well the effect of climatic fluctuations in equatorial forest/savanna borderlands. Today, Matupi Cave is situated in the equatorial forest, but excavations produced faunal evidence that during Late Pleistocene times the area around Matupi was a savanna (VAN NOTEN, 1977; VAN NEER, 1981). Here, the changing climatic conditions after 12000 BP caused a shift in vegetation from savanna to equatorial forest. Our analysis does not reveal any faunal affinities pointing to an equatorial forest in the vicinity of Ishango. We hence conclude that the Ishango civilisation did not coincide with wetter conditions and with an expansion of the equatorial forest.

A faunal break separates the formation of the Ishangian levels and the levels related to the younger occupation stage. This is illustrated by the abundance of *Barbus*, *Synodontis* and *Lates* and the presence of giant buffalo in the older deposits *versus* the lower frequencies or absence of these fish genera in the younger deposits, together with the explosive appearance of *Bagrus*, the replacement of the giant buffalo by the extant buffalo and the appearance of the highly territorial kob. Both occupation stages were most likely separated by a period of time, during which important ecological shifts took place, leading to a changed environment and hence a different faunal spectrum.

On the basis of the evidence summarised above, the sequence of events at Ishango can be divided roughly into three stages.

The first stage, characterised by the Ishangian levels, is illustrative for a Late Pleistocene hunter-fisher-gatherer community adapted to relatively dry and open savanna living conditions. For the moment it is impossible to give a more precise estimate of the age of the Ishango culture, but it is not inconceivable that the N.F.PR. assemblage relates to one of somewhat drier phases that occurred within the second half of the Late Pleistocene, i.e. from ca. 21000 to 17500 BP or from 14500 to 12500 BP (cf. GASSE, 1980; WILLIAMS, 1985).

The second stage corresponds with the period between the formation of the Ishangian levels and the deposition of the younger assemblage. During this period, volcanic activity may have been responsible for the severe reduction or even local extinction of some species. Wetter climatic conditions can be invoked to explain the appearance of two new and more water-dependent ruminants in the area, kob and African buffalo. Furthermore, if *Bagrus* arrived in Lake Rutanzige via the Semliki river after the formation of the older deposits, its appearance may perhaps be indicative for a more or less permanent high water level of the river. It may have

enabled *Bagrus* to pass obstacles such as the rapids, which today seem to prevent Lake Rutanzige from being recolonised by fish living in the Lower Semliki and in Lake Mobutu. The foregoing assumptions, combined with the fact that high lake levels and considerable erosional processes took place after the formation of the Ishango horizons, suggest that this second stage may have coincided, at least partially, with the early Holocene wet period.

The third stage, characterised by the faunal remains from the Z.POST-EM., provides us with a picture of another human population, again adapted to savanna living conditions and relying on hunting, fishing and gathering for their food supply. The faunal assemblage, though illustrative for a savanna herbivore community, may indicate slightly better climatic conditions than those prevailing during the first stage. This occupation stage might postdate the early Holocene period.

7. SUMMARY AND CONCLUSIONS

The faunal material collected at Ishango during the early fifties has been reconsidered. In particular, this study deals with the mammalian remains collected in the aceramic layers and presents an updated evaluation of the Ishango faunal assemblages from the archaeozoological point of view.

Two major occupation stages can be distinguished, i.e. an older one characterised by the presence of bone harpoons and a younger one where such implements are absent. The faunal samples related to these stages have a large anthropogenic and a less important intrusive component. Both faunal assemblages, though clearly different in species composition, illustrate that mammals, especially Artiodactyls, and fish provided most of the animal proteins for the Ishango inhabitants. Direct evidence for some fishing and hunting methods is limited to the older stage with its different types of harpoons and its spear points made of bone. Besides, the age distribution of certain antelopes such as topi suggests that during both stages, hunting may also have been practised with the aid of non-selective gear such as snares and traps. Fishing concentrated in the littoral zone and along the margins of Lake Rutanzige, in the marshes and swamps adjacent to the Semliki and in seasonally inundated areas, if these existed. Hunting focused on mammals that frequented the open grasslands stretching from the lake shore up to the hills. Neither the fish nor the mammals provide us with exact information about the period or season of occupation. However, the presence of two Palaeartic migratory birds in the avian samples confirm our model that Ishango may have been inhabited from September till March, i.e. during autumn and winter.

In order to obtain some insight in the processing of fish and meat at Ishango, we compared the Ishango body part frequencies with those obtained at other African sites. If we take into account differential preservation, sampling bias, sample size, differences in quantification methods and the *facteur de reconnaissance*, it is concluded that the Ishango body part distributions do not differ markedly from those observed elsewhere. Thus, clear evidence for some kind of meat or fish

processing is lacking at Ishango.

The terrestrial vertebrates found in the two major assemblages are characteristic for semi-open to open savannas. This indicates that during prehistoric times, living conditions at Ishango were more or less comparable to those prevailing today. However, the composition of the older assemblage may imply a somewhat drier climate during this occupation stage, whereas the younger assemblage may reflect somewhat moister climatic conditions.

On the basis of the archaeological, sedimentological, geological and faunal evidence, the sequence of events at Ishango can be divided roughly into three stages. The first stage is illustrative for a Late Pleistocene hunter-fisher-gatherer community, adapted to relatively dry and open savanna living conditions. Probably this phase coincides with one of the somewhat drier periods that occurred within the second half of the Late Pleistocene, i.e. from ca. 21000 to 17500 BP or from 14500 to 12500 BP. The second stage corresponds with the period between the formation of the older and the younger deposits. During this stage, volcanic activity may have been responsible for the local extinction of some species. Wetter climatic conditions can be invoked to explain the appearance of some new mammals and fish, and to explain the high lake levels. This stage may have coincided, at least partially, with the early Holocene wet period. The third stage provides us with a picture of another human population, again adapted to savanna living conditions. This stage might postdate the early Holocene period.

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 Plate I

- Fig. 1 : *Pelorovis antiquus*, upper M1, occlusal view (N.F.PR., 1 : 1)
 Fig. 2 : *Pelorovis antiquus*, metatarsus, proximal view (N.F.PR., 2 : 3)
 Fig. 3 : *Pelorovis antiquus*, metatarsus, distal portion, dorsal view (N.F.PR., 2 : 3)
 Fig. 4 : *Pelorovis antiquus*, calcaneus, medial view (N.F.PR., 2 : 3)
 Fig. 5a : *Pelorovis antiquus*, talus, plantar view (N.F.PR., 2 : 3)
 Fig. 5b : *Pelorovis antiquus*, talus, dorsal view (N.F.PR., 2 : 3)
 Fig. 6a : *Pelorovis antiquus*, phalanx 1, palmar view (N.F.PR., 2 : 3)
 Fig. 6b : *Pelorovis antiquus*, phalanx 1, axial view (N.F.PR., 2 : 3)
 Fig. 7 : *Pelorovis antiquus*, phalanx 3, abaxial view (N.F.PR., 2 : 3)
 Fig. 8 : *Taurotragus* sp., phalanx 3, abaxial view (N.F.PR., 2 : 3)
 Fig. 9 : *Alcelaphus* sp., horncore (N.TUF., 1 : 2)
 Fig. 10 : *Tragelaphus scriptus*, horncore (Z.POST-EM., 1 : 2)
 Fig. 11 : *Redunca redunca*, horncore (N.F.PR., 2 : 3)
 Fig. 12 : *Hippotragus equinus*, lower M1, occlusal view (N.F.PR., 1 : 1)
 Fig. 13 : *Redunca redunca*, pathologic talus, dorsal view (Z.POST-EM., 1 : 1)
 Fig. 14 : *Kobus kob*, mandible, occlusal view (Z.POST-EM., 2 : 3)
 Fig. 15 : *Ourebia ourebi*, pathologic mandible, medial view (N.F.PR., 1 : 1)



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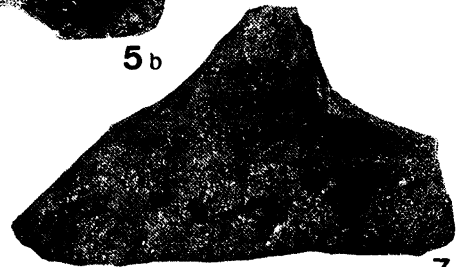
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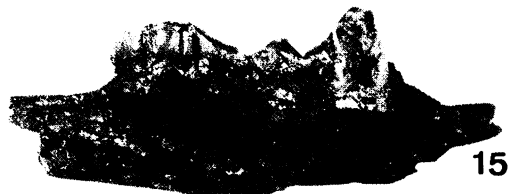
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 Plate II

- Fig. 1 : *Equus burchelli* ?, upper molar, occlusal view (Z.POST-EM., 1 : 1)
 Fig. 2 : *Damaliscus lunatus*, horncore (N.F.PR., 1 : 2)
 Fig. 3 : *Thryonomys swinderianus*, mandible, medial view (N.F.PR., 1 : 1)
 Fig. 4 : Cercopithecoid, humerus, distal portion, dorsal view (N.F.PR., 1 : 1)
 Fig. 5 : *Lutra maculicollis*, mandible, medial view (N.F.PR., 1 : 1)
 Fig. 6 : *Aonyx* sp., calcaneus, medial view (N.F.PR., 1 : 1)
 Fig. 7 : *Phacochoerus aethiopicus*, mandible with pd 4, occlusal view (N.F.PR., 1 : 1)
 Fig. 8 : Rhinoceros, phalanx 3, dorsal view (N.F.PR., 1 : 1)
 Fig. 9 : *Hippopotamus amphibius*, pd 4, occlusal view (N.TUF., 1 : 1)
 Fig. 10 : *Orycteropus afer*, metacarpus V, palmar view (N.F.PR., 1 : 1)
 Fig. 11 : *Haliaeetus vocifer*, tarsometatarsus (N.F.PR., 1 : 1)
 Fig. 12 : *Plectropterus gambensis*, carpometacarpus (N.F.PR., 1 : 1)
 Fig. 13 : *Mycteria ibis*, tarsometatarsus, distal portion (N.F.PR., 1 : 1)
 Fig. 14 : Encrustation of bone material with shell fragments and coarse sediments.



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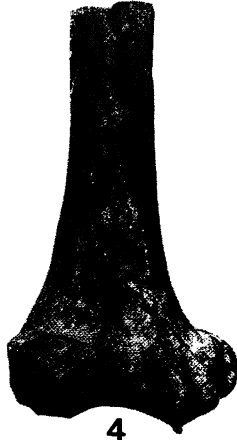
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