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Animal remains from predynastic sites in the Nagada region, Middle Egypt

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ABSTRACT: Faunal samples from excavations between 1974 and 1981 in predynastic sites and a late predynastic/early dynastic cemetery in the Nagada region are inventoried. The faunal spectra compare well with those of other neolithic and predynastic sites of Nilotic Egypt. They point to agrarian communities relying mainly on fishing and livestock, as also suggested by most other known sites of the same neolithic and predynastic contexts. The neolithisation of the Nile Valley is an earlier event, perhaps coeval with and related to the origin and development of the complex pastoralist Late Neolithic of Nabta and the Western Desert.

KEYWORDS: ARCHAEOZOOLOGY, EGYPT, PREDYNASTIC, NEOLITHISATION

RÉSUMÉ: Les échantillons de faune provenant de fouilles dans la région de Nagada, Moyenne Égypte, entre 1974 et 1981 dans plusieurs sites prédynastiques et dans un cimetière prédynastique/dynastique ancien sont inventoriés. Les spectres fauniques comparent bien avec ceux établis dans d'autres sites de la même période en Égypte nilotique. Ils indiquent des communautés agraires pratiquant principalement la pêche et l'élevage, comme suggèrent la plupart des sites connus des mêmes contextes néolithiques et prédynastiques. La néolithisation de l'Égypte nilotique est un processus antérieur, peut-être contemporain et lié à l'origine et au développement du Néolithique Récent de Nabta dans le Désert Occidental.

MOTS-CLÉS: ARCHEOZOOLOGIE, EGYPTE, PREDYNASTIQUE, NEOLITHISATION

RESUMEN: Se detallan una serie de asociaciones de fauna procedentes de excavaciones desarrolladas entre 1974 y 1981 en yacimientos predinásticos y un cementerio predinástico/dinástico temprano de la región de Nagada. Los espectros de fauna son comparables con los de otros yacimientos neolíticos y predinásticos del Egipto nilótico. Estos estudios apuntan a que las comunidades agrarias de entonces se fundamentaban en la pesca y la cría de ganado, algo que concuerda con lo aparecido en la mayoría de los restantes contextos neolíticos y predinásticos. La neolitización del valle del Nilo resulta ser un fenómeno previo, posiblemente coetáneo y relacionado con el origen y desarrollo del complejo tardo-neolítico pastoralista de Nabta y del desierto occidental.

PALABRAS CLAVE: ARQUEOZOOLOGÍA, EGIPTO, PREDINÁSTICO, NEOLITIZACIÓN

INTRODUCTION

Reports on the general faunal spectrum and the fishes of predynastic sites in the Nagada region excavated between 1974 and 1980 were ready by about 1985, but never went to the printer. For unknown reasons faunal material from excavations in 1981 was stored in the catacombs of the Research Unit of Palaeontology of the University of Ghent, rediscovered almost twenty years later and analysed by Hauspie (2001) in her licentiate memoir under the direction of the senior author. Her results revised by the senior author have been incorporated in this report. Notes on the sites are based on several publications (Hays & Hassan, 1976; Hassan, 1981, 1984, 1988, 1999; Holmes, 1989) and on personal communications provided by Dr. T.R. Hays (at the time, Institute of Applied Sciences, North Texas State University, Denton) and Dr. F.A. Hassan (now retired from University College London, Institute of Archaeology) mainly in the period immediately following the excavations.

Exploration of the predynastic in the Nagada region (Figure 1) which is situated midway between Qena and Luxor on the left bank of the Nile began with the work of de Morgan (1896, 1897) and Petrie and Quibell (1896) on several funeral and settlement contexts. The two major settlements were labelled Nagada North Town and Nagada South Town by the second archaeologists team. From the cemeteries dug by Petrie and Quibell, Flores (2003) records a dog apparently lying in a human grave, a «pit» with some twenty (!) dogs and grave gifts of parts of cattle, sheep and quite a few gazelles. Faunal remains collected by de Morgan from settlements near Toukh were studied by Gaillard (1934). In 1968 the Combined Prehistoric Expedition to Egypt looking for palaeolithic occurrences in the region came across a promising predynastic site that the senior author, participating in the expedition, remembers vaguely. Archaeological surveys between Ballas and Danfiq and excavations by Hays and Hassan followed in 1975, 1976, 1977, 1978, 1980 and 1981 (Hays & Hassan, 1976; Hassan, 1981). Six additional sites were then found and excavations were undertaken at these sites as well as at the first site recorded and in the settlement sites of Petrie and Quibell, referred to as North Town and South Town from now onwards. The seven new sites were numbered 75/1 (the site found in 1968) etc., but were later renamed KH(attara)1 etc. As the map (Figure 1) shows, these sites are located along the margin of the low desert over Late Pleistocene terrace deposits adjacent to the floodplain, which is now intensively cultivated. Site 2 is a looted late predynastic/early dynastic cemetery, whereas the others are settlements. The loci excavated at South Town during the earlier campaigns, that is, before 1980, seem also to have been disturbed by farmers digging for fertilizer. Perhaps other sites were also disturbed in the same way. The settlements consist of organic-rich deposits with charcoal, animal remains, ceramics and lithic artefacts. In size they range from a few thousand square meters to 3 ha. Evidence of dwellings, hearths, storage pits, trash areas, dung-layers of sheep and goat enclosures and some graves clearly indicate permanent occupation for several generations in small villages and hamlets. Radiocarbon dates range from c.5300 to c.3800 bp. Comparison of the calibrated dates from sites 1, 6 and 3 and El Abadiya, a comparable settlement immediately south of site 7, suggests that the settlements were occupied for a few centuries between 3700 and 3800 cal BC. The Nagada sites have been attributed to Nagada I-IIA/B (Vermeersch *et al*., 2004). A chronological sequence grouping most of the faunal samples was provided for the earlier samples by Dr. Hassan, who later confirmed it. In the tabulation of the sequence that follows, the assemblages are listed in order of their appearance in Table 1 and UL stands for Upper Levels, LL for Lower Levels. Not included are the older South Town collection, 73/3A varia and KH4, because their significance is not clear.

Assemblage E:	75/2, KH2
Assemblage D:	South Town 1978 and 1980
Assemblage C:	75/3A-UL, 75/6A
Assemblage B:	75/1, 75/1A, 75/3A-LL, 75/3B-UL, 75/3C, 75/7, KH1, KH3 (1978), KH3B-UL (1978), KH3C, KH3P, KH3 (1980), KH3B-UL (1980), KH7, KH3 (1981).
Assemblage A:	75/3B-LL, KH3B-LL (1978), KH3B-LL (1980).

On the basis of the first available data Dr. F. Hassan originally estimated the sequence A to D to cover the period from about 3900 to 3450 BC. He put assemblage E at about 3100 BC. However, and as already noted KH2 is a looted cemetery and the assemblage may combine animal remains dating to the burial events, reworked older remains in the burials and even some remains left by the looters.

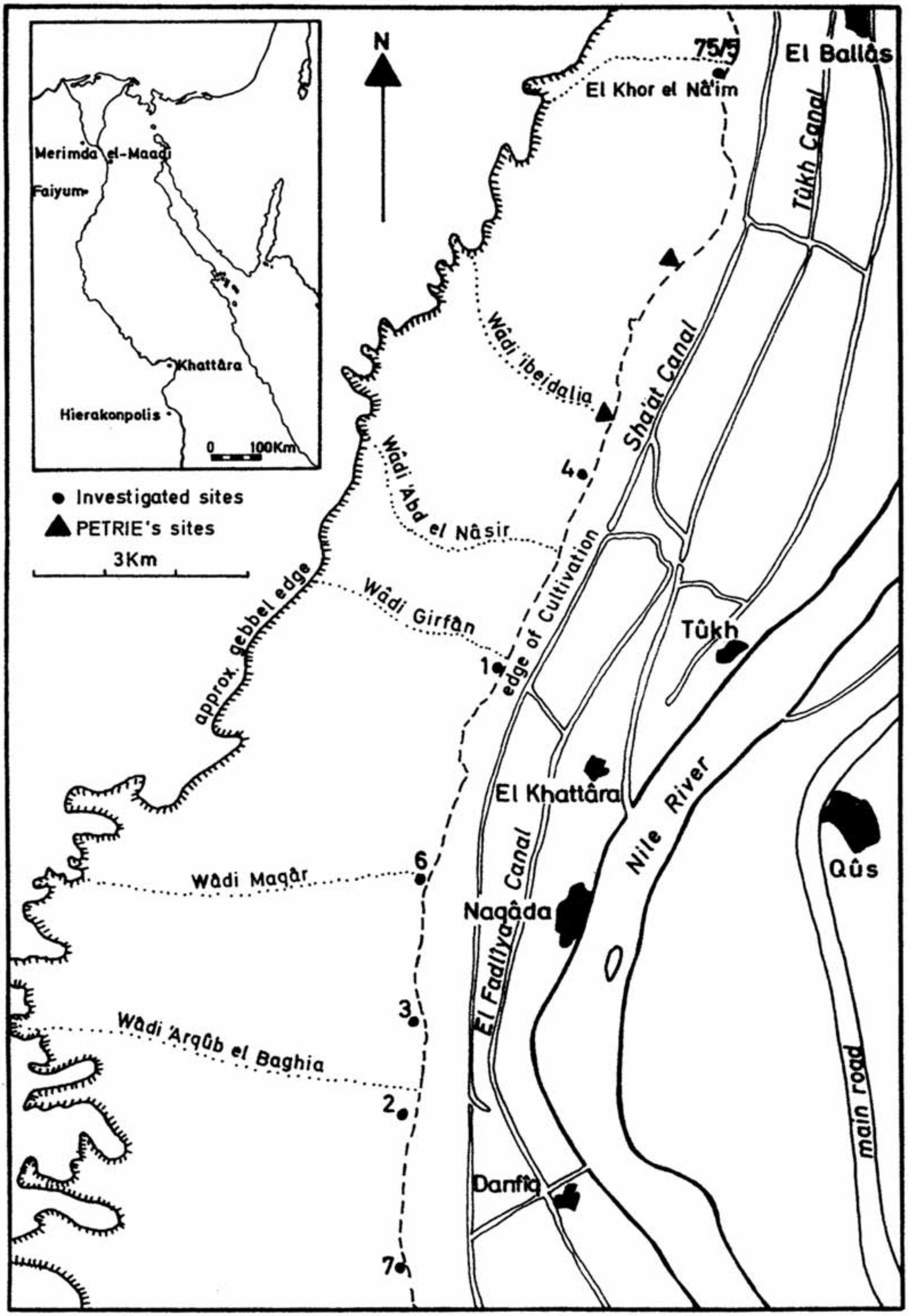


FIGURE 1

Location of the Nagada sites and some other neolithic or predynastic settlements (after Hays & Hassan, 1976).

Animal group	South Town **1975**	75/1	75/1A	75/2	75/3A- UL	75/3A- LL	75/3A varia	75/3B- UL	75/3B -LL	75/3C	75/6A	75/7	South Town **1978**	KH1	KH3	KH3B-UL	KH3B-LL	KH3C	KH3P	South Town **1980**	KH2	KH3	KH3B-UL	KH3B-LL	KH7	KH3 **1981**	KH4	totals
Cypraea caurica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Bellamya unicolor	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	1	-	4
Cleopatra bulimoides	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Lanistes carinatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Corbicula consobrina	-	-	F	-	6	F	F	F	-	-	-	-	-	1	F	F	F	R	-	?	?	?	?	?	?	R	-	F
Coelatura aegyptiaca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Chambardia rubens	-	-	1	-	1	1	-	-	1	-	-	-	2	4	1	10	-	-	-	4	2	2	6	-	-	5	-	40
Etheria elliptica	-	-	-	-	-	1	-	1	-	-	-	-	-	3	-	-	1	2	-	-	-	-	-	-	-	-	-	8
fish (a)	-	-	5	1	1	1	1	16	20	4	1	4	3	12	1	10	1	13	5	32	5	31	31	25	2	221	-	446
toad or frog	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
small lizard	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	3
soft-shelled turtle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	32	-	33
birds (b)	-	-	4	-	1	-	-	3	-	-	1	-	-	4	-	2	-	2	-	-	-	2	3	2	-	4	-	28
ostrich egg shell	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	2
hare	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	1	1	-	-	-	-	-	4
small rodents (c)	-	-	F	R	F	R	F	F	-	F	-	R	R	R	R	F	F	-	R	R	R	R	R	R	-	F	-	F
fox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
striped hyena	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
hartebeest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
dorcas gazelle	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-	-	2	-	6
dog	-	-	1	-	-	-	-	-	-	-	-	1	-	1	1	-	-	1	-	7	1	-	-	-	1	5	10	29
pig	4	-	5	-	10	5	4	5	6	1	2	2	12	3	5	35	1	9	11	41	3	24	19	4	8	147	-	366
sheep/goat	45	1	18	1	18	9	16	22	12	8	7	6	20	35	43	32	3	45	9	60	30	122	62	20	9	479	-	1132
cattle	-	-	4	1	4	1	4	8	7	2	5	-	19	3	6	69	14	13	4	37	7	60	20	5	13	128	-	434
total identified bone (d)	49	1	38	3	34	16	25	54	46	15	16	14	54	58	56	151	20	84	30	179	47	240	135	56	33	1025	10	2489
unidentified bone (e)	50	-	125	12	100	50	50	400	200	100	F	80	135	470	290	820	130	395	240	2080	580	1425	625	75	125	5000	-	13700
total bone (e)	100	1	165	15	135	65	75	455	245	115	F	95	190	530	345	970	150	480	270	2260	625	1665	760	130	160	6025	10	16190

TABLE 1

The major assemblages of the Nagada excavations (specimens counts), grouped in earlier excavations (1971 etc.), 1978, 1980 and 1981. a: see Table 2; b & c: see text; d: rodents and molluscs not included; e: mainly estimates; F/R: frequent/rare; ?: not collected.

Botanical remains include mainly emmer wheat (*Triticum dicoccum*) and six-row hulled barley (*Hordeum vulgare*), the latter apparently twice as frequent as the former. This suggests that barley, which is much resistant to drought and salinity, was cultivated more intensively than wheat as it was the case from the pharaonic period until AD 1825 when perennial irrigation started. Other plant remains are often field weeds. Pollen of several plants with medicinal use were also identified. The faunal spectrum is clearly dominated by the domestic quartet of sheep and goat, cattle and pig. Comparison of the quantities of comminuted bone in modern midden sediments in the region with those in the predynastic ones moreover suggests that meat was a more substantial element in the diet of the predynastic people of Nagada than is the case today for rural Egypt.

The material was hand picked and collected from sieves with a mesh of 4 mm; therefore recovery of micromammals and some other small vertebrates was possible. It is obvious, however, that a great number of the fish remains will have been missed since only the 2 mm mesh usually retains most of the fish bone. The osseous remains have generally a yellowish colour, but specimens which have been exposed on the surface are most often bleached. Some specimens are covered with specks of calcium carbonate powder; on others one sees growths of small crystals of natrium chloride. The various stages of weathering described by Behrensmeyer (1978) are present, no doubt as a result of desiccation and collagen destruction under subarid to arid conditions. Most of the remains are much fragmented as a result of butchering and consumption practices upon which severe weathering followed. Samples from South Town collected in 1975 contain the mummified, incomplete remains of a sheep or goat tail and the mummified terminal segment of a sheep leg consisting of its three phalanges, clearly indicating burial under very dry conditions. Other remains from the same context seem to be derived from more degraded mummified sheep or goats. In some other cases bones which articulate were found together, suggesting that these remains were disposed of when still in connection but that later degradation of the remaining soft tissues made them come apart.

Most of the finds were identified with the aid of the documentation and comparative collections of the Research Unit Palaeontology, Ghent University (molluscs, vertebrates except fish) and the Royal Belgian Institute of Natural Sciences, Brussels (fish). Several studies deal with the animals encountered in neolithic and predynastic sites along the Egyptian Nile and helped to place the Nagada finds in context. Fayum sites have been added to these occurrences, because their faunal spectra strongly resemble the typical Nile valley spectra. Peters (1986) revised the fauna from Toukh analysed by Gaillard (1934). The more extensive analyses of the animal remains excavated in various sites are listed in what follows from north to south: Buto (von den Driesch, 1997); Tell Ibrahim Awad (Boessneck & von den Driesch, 1988); Tell el Iswid (Boessneck & von den Driesch, 1989); Merimde Beni Salama (von den Driesch & Boessneck, 1985); Maadi (Bökönyi, 1985; Boessneck *et al.*, 1989); El Omari, Helwan (Boessneck & von den Driesch, 1990); Fayum, early neolithic (Gautier, 1976; von den Driesch, 1986; Brewer, 1989); Maghar Denderah 2 (Hendrickx *et al.*, 2001), El Abadiya 2 (Vermeersch *et al.*, 2004); Armant (Boessneck & von den Driesch, 1994), Adaïma (Van Neer, 2002); Hierakonpolis (McArdle, 1982, 1987, 1992; Van Neer *et al.*, 2004, animal burials). As the reanalysis of the Toukh finds is rather inaccessible, its results are here summarized: *Bellamya unicolor* (1 find), *Chambardia* sp. (3), Nile perch (2), catfish (*Clarias* sp. 1; *Synodontis schall* 1), soft-shelled turtle (1), stork (*Ciconia* sp. 1), crane (*Grus grus* 1), wood ibis (*Ibis ibis* 1), ostrich egg shell (present), dorcas gazelle (3), dog (1), pig (7), sheep and goat (13), cattle (10). The collection contains only two unidentified fragments, indicating very selective sampling. Data on the livestock identified in predynastic el Mahâsna near Abydos were available in Anderson (2006). Gautier (1987) provides a summary of the animals found in palaeolithic and epipalaeolithic sites along the Egyptian Nile.

The original plan was to use the chronological divisions provided by Dr. Hassan for the presentation of the fauna. Later the senior author decided to present some of the assemblages separately and Table 1 summarizes the composition of the main assemblages collected in the subsequent excavation periods. More detailed inventories for some of the major sites with several excavation loci would make the table unduly complicated. As it now stands, it illustrates nicely the marked difference in size and contents of the collections. Following the original plan, the fishes were brought together in the given chronological divisions by the senior author. As a result the junior author could not provide detailed inventories and Table 2 uses the chronological divisions to present the fish fauna. Some of the fish remains of the collections were not found back and therefore the number of analysed fish remains in Table 2 is lower than their number recorded in Table 1 by the senior author.

	A	B	C	D	E	total
elephant fish (Mormyridae)	-	1	-	-	-	1
tetras (*Alestes/Brycinus*)	-	3	-	-	-	3
carp fish (Cyprinidae)	-	14	-	-	-	14
clariid catfish (Clariidae)	5	180	1	9	2	197
bagrid catfish (*Bagrus* sp.)	-	4	-	3	-	7
mochokid catfish (*Synodontis* sp.)	2	17	-	4	3	26
Nile perch (*Lates niloticus*)	-	24	-	5	-	29
tilapia (Tilapiini)	1	18	-	6	-	25
total identified fish	8	261	1	27	5	302
unidentified fish	6	98	-	8	-	112

TABLE 2

Frequencies of the fish bone in the Nagada chronological sequence (specimens counts).

As said, most of the finds are in poor condition, making counts of the unidentifiable material difficult. Therefore only rough estimates of this material are given and combined to estimates of the total quantities of bone remains of the assemblages. The total identification rate, that is, the ratio of identified remains/total remains, is about 15% and in most assemblages the rates are below 20%. Higher rates reflect the hazards of the sampling and in the case of South Town 1975 (49%) the fact that the finds are well preserved as they derive often from animal burials. Some other occurrences most likely also represent clusters derived from individual animals, such as the fox and the KH4 dog. These finds should not have been entered in the table as so many separate specimens, as, by definition, a specimen consists of all the finds which clearly come from the same skeletal element or a combination of such elements. However, the few inflated counts do not affect our overall computations. Some notes on the identifications and animals encountered follow. In these notes the references to the faunal analyses listed above will generally not be repeated.

AN OVERVIEW OF THE FAUNA

Marine molluscs: Cowry (*Cypraea caurica)*

A fragmentary cowry was collected during the 1980 excavations at South Town and identified with the aid of colleagues in London. The fragment is derived from *Cypraea caurica* a species known from the Red Sea. Various marine molluscs have been found in predynastic sites. Most of these are gastropods and come from the Red Sea or the Indian Ocean (see summaries in Krzyzaniak, 1977). They suggest direct or indirect trading with the east coast of Africa.

Large freshwater bivalve: *Chambardia rubens*

This larger naiad bivalve occurs in several sites under the form of fragments of varying size. It has been recorded in many neolithic or predynastic sites of Nilotic Egypt under the names *Spatha cailliaudi*, *Spatha rubens*, *Spathopsis rubens* or *Aspatharia rubens*. Pain & Woodward (1962) discussed the synonymy of the species, which is distributed in West Africa, the northern part of Central Africa and the Nile basin. According to the rules of zoological nomenclature it has to be renamed *Chambardia rubens* (Daget, 1998; Mienis, 2004). Predynastic valves have been used as dishes, scoops or ladles. Specimens with a serrated edge may have been scrapers, and fish hooks and neck laces were apparently also made of *Chambardia*. The species also occurs in neolithic sites in the Western Desert (Gautier, 2001), neolithic sites in northern Sudan (see for example Gautier, 1986) and is known from Pharaonic contexts (Boessneck & von den Driesch, 1992; Gautier, 2005). Trade of *C. rubens* during the Holocene brought its valves to Israel, Jordan, Cyprus, Turkey and Carthage in Tunisia (Reese *et al.*, 1986). Clearly *C. rubens* was for a long period and over a large region known as a natural material with many uses. In our collection no worked shells or shell fragments are present, but such remains may have been added to the artefact collections.

Other freshwater molluscs

These include gastropods such as the viviparid *Bellamya unicolor*, a rolled specimen of *Cleopatra bulimoides* and a fragment of *Lanistes carinatus*. The freshwater bivalves comprise many isolated valves of *Corbicula consobrina*, one bivalve specimen of *Coelatura nilotica* and some fragments of the Nile oyster *Etheria elliptica*. These shells represent part of the usual molluscan fauna in the alluvial deposits on which the sites are situated (see Martin, 1968). The Nile oyster may be an exception: the senior author thought for a long time that the shell of this larger bivalve was too fragile to be used for making artefacts, until he found out that the central part of the valves is dense and can be easily worked (Gautier, 2001). *Coelatura* was formerly known as *Caelatura* as a result of misspelling of the diphthong in the name (Rosenberg *et al.*, 1990). As to *Corbicula consobrina*, it is probably the African subspecies of *C. fluminalis*, the latter itself closely related to *C. fluminea* (Korniushin, 2004). These corbiculids are very successful invaders and *C. fluminalis* is well known from the warmer periods of the European Pleistocene. Their rapid expansion is no doubt due in part to their hermaphroditic reproduction. They seem to prefer moving waters and sandy substrates in which they bury themselves close to the surface (Dr. D. Van Damme, Ghent, pers. comm.). Hays & Hassan (1976) report *C. consobrina* and *Unio aegyptiacus* from deposits underlying some of the sites. *U. aegyptiacus* is obviously our *Coelatura aegyptiaca* and the deposits containing the named bivalves seem to be mainly fine sands and not the typical silts of the main floodplain.

Fish

Table 2 lists the fish remains according to the chronology. The family of the elephant fish (Mormyridae) is represented by a single caudal vertebra of a fish measuring between 50 and 60 cm SL (standard length, i.e., the distance between the tip of the snout and the base of the tail). Mormyrids are relatively rare on Egyptian archaeological sites, possibly because they were never very abundant, but also because of the rather fragile nature of their bones. Three caudal vertebrae attest to the presence of tetras (genera *Brycinus*, *Alestes* and *Micralestes* belonging to the Characiformes). One of the bones is from a fish measuring 5-10 cm SL, the two others derive from individuals between 20 and 30 cm SL. Of the species occurring in the Egyptian Nile only *Alestes dentex* and *Alestes baremoze* attain sizes above 20 cm SL. The junior author noticed that in the Egyptian Nile Valley, the fish of this group are often referred to as «sardines», for as certain other fish taxa do, they live in schools. Because their meat is full of bones, they are today preferentially prepared as salt fish. Fourteen bones belong to the family of the carps (Cyprinidae): except for one fragment of a pharyngeal plate, they are all vertebrae of fish from three size classes: 20-30 cm SL (1 specimen), 30-40 cm SL (4 specimens), and 40-50 cm SL (10 specimens). Cyprinids of that large size can belong to either *Barbus bynni*, or one of the four species of *Labeo* that are found in the Egyptian Nile: *Labeo niloticus*, *L. horie*, *L. coubie* and *L. forskalii*. About two thirds of the identified fish bones derive from catfish of the family Clariidae. Using the diagnostic characters described in von den Driesch (1983) and Gayet & Van Neer (1990) it appears that all five well preserved pectoral spines belong to the genus *Clarias*, and not to the less common *Heterobranchus*. Assuming that all the clariid bones belong to the genus *Clarias*, there is one bone that can be identified to species: a completely preserved vomerine tooth plate has the typical broad appearance of *Clarias gariepinus* (see Gautier & Van Neer, 1989: 126). Reconstructed sizes of the fish vary between 20-30 cm SL and 110-120 cm SL, with an apparent preponderance of individuals above 70 cm SL (Figure 2). Among the bagrid catfish (*Bagrus* sp.) also a marked variation in size is seen. Reconstructed lengths are 20-30 cm SL (2 specimens), 30-40 cm SL (1 specimen), 50-60 cm SL (2 specimen), 70-80 cm SL (1 specimen) and 80-90 cm SL (1 specimen). None of the bagrid remains, 3 skull bones and 4 vertebrae, could be attributed with certainty to either *Bagrus bajad* or *Bagrus docmak*, the two species living in Egypt today. Another catfish taxon at Nagada is *Synodontis*, a genus with several species, but of which in archaeological sites one encounters mainly *Synodontis schall*. This species, which is also the most common in Egypt today, is also present at the Nagada sites, as shown by a single well preserved cleithrum. The *Synodontis* measured between 10 and 20 cm SL (10 specimens) and between 20 and 30 cm SL (7 specimens). The Nile perch (*Lates niloticus*) represents about 10% of the identified fish bones. They belong to fish of variable size, with two exceptional specimens of about 1.5 m (Figure 2). Finally, the tilapia are rather well represented (8% of all identified fish) and include individuals of 20-30 cm SL (5 specimens) though mainly of 30-40 cm (13 specimens). A single fish of 40-50 cm SL occurs as well.

Small herpetofauna: Anuran and small lizards

Two long bones (KH3 1981) derive from a relatively large anuran. In two assemblages (75-1A; KH3-1981) the partially mummified skull and elements of the axial skeleton of a tiny lizard (length of the skull c. 12 mm) were collected. Another find is a lower jaw with a few teeth from a larger lizard (KH3 1981). Lack of comparative material and experience with these vertebrate groups precluded identification of these indubitably intrusive elements.

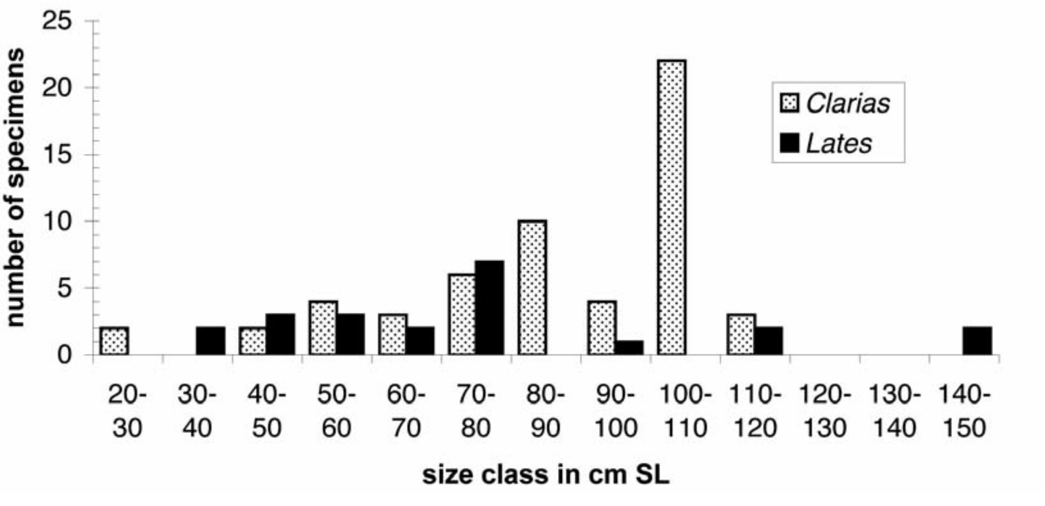


FIGURE 2
Reconstructed lengths of the *Clarias* catfish and of the Nile perch (*Lates*).

Soft-shelled turtle (*Trionyx triunguis*)

A cluster of some 32 carapace elements in a sample of the KH3 1981 collection derives from one soft-shelled turtle. In the older collection only one carapace fragment seems to represent the same species. The meat of soft-shelled turtles is considered to be tasty but finds in neolithic and predynastic sites are rare. Van Neer (2002), when referring to the finds from Adaïma, suggests that people may have captured these turtles in their nets when fishing, but Boessneck & von den Driesch (1990) point out that large specimens of the species can damage these devices. Large specimens may hence have been speared as shown in Pharaonic art (Boessneck, 1988).

Birds

Bird remains total only 28 fragments, but many are poorly preserved and therefore unidentifiable. Some specimens from the material collected until 1980 were identified by Mrs Matthiesens (Department of Zooloogy, University of Florida, Gainesville):

Grey heron (*Ardea cinerea*): one find in 75/3A-UL (tentative), one find in KH3 (1980).

Common crane (*Grus grus*): two finds in KH1.

Common quail (*Coturnix coturnix*): one find in 75/1A.

Dove (*Streptopelia*): one find in 75/1A, one find in 75/3B-UL, another in KH3-LL (1980).

Brown-necked raven (*Corvus ruficolis*): one find in 75/1A, another in 75/6A.

According to Bruun & Baha el Din (1994), four species of dove (*S. turtur*; *S. senegalensis*; *S. roseagrisea*; *S. decaocto*) occur and breed in present-day Egypt. The identified raven is a common resident. The other birds are most likely migratory specimens killed when coming to or passing through the Nile Valley. The ostrich is represented by two egg shell fragments modified into beads; most of the ostrich egg shell finds, modified into beads or not, were probably added to the artefact collections. Bird remains, in several cases derived from the same species as in our sites, occur in other neolithic and predynastic sites, but are never frequent. The spectrum is therefore limited, except at Merimde Beni Salama, because the faunal sample of that site is so large. We also note that ostrich is exclusively represented in the sites by egg shell fragments, except again in Merimde Beni Salama where the animal itself appears to have been on the menu. The ostrich is also absent in the game bag of the palaeolithic people of the Nile, but a few finds from the eastern Sahara (Van Neer & Uerpmann, 1989; Churcher, 1992) suggest that it was occasionally taken by Holocene hunters.

Mammals

Measurements were taken following von den Driesch (1977) and are given in millimetres. The measurements of livestock have been compared with the extensive series of measurements on livestock remains from the Iron Age site of Manching, Bavaria (Boessneck *et al*., 1971). Conversion factors to estimate heights at the withers from the lengths of individual complete long bones of domestic animals are given by von den Driesch & Boessneck (1974). We are well aware that these factors may not be always reliable because of possible differences in habitus between early European and Ancient Egyptian livestock.

Hare (*Lepus capensis*)

The remains of hare include a subadult vertebra, a somewhat doubtful humerus fragment, a metacarpal and a fragment of an innominate bone, all of comparatively small size. African specimens of *L. capensis* are indeed smaller than their European equivalents. Finds of hare in neolithic and predynastic sites are rare. The animal is also not frequent in palaeolithic and epipalaeolithic sites along the Nile, but was regularly bagged in the neolithic of the Western Desert (Gautier, 2001), because large game is absent there.

Rodents

These were identified with the aid of Osborn & Helmy (1980). The most frequent rodent, represented by cranial remains, mandibles and postcranial material is the greater gerbil, *Gerbillus pyramidum*. In the Nile Valley this gerbil makes its burrows in sandy areas near cultivation, palms groves, canal banks and desert edges areas. It shares its habitats with the small gerbil *Gerbillus gerbillus*, the murid *Arvicanthis niloticus* and the black rat *Rattus rattus*. The small gerbil is probably represented by one edentulous mandible in 75-3B-LL, but many remains can be assigned to *A. niloticus*. Some remains of a skull (KH3-C) are definitely attributable to the lesser jerboa, *Jaculus jaculus*. This jerboa is found in the same environments as gerbils, but keeps away from cultivated areas. Small rodents often pertaining to species encountered in our sites have been collected in many neolithic and predynastic sites, especially if sieving was practised. At Adaïma, for example, gerbils, mainly *G. pyramidum*, are very frequent but *Arvicanthis niloticus* is also quite well represented.

Common fox (*Vulpes vulpes*)

Two surface finds from KH3 1981 comprising a femur and a metatarsal bone pertain to a small common fox. Their white colour indicates that they may be remnants of a recent carcass. The common fox occurs in several neolithic and predynastic sites but is generally not conspicuous. In palaeolithic and epipalaeolithic contexts along the Nile the animal is also rare.

Striped hyena (*Hyaena hyaena*)

A large carnivore is represented in the South Town 1980 sample by the distal half of a second metacarpal with a distal transverse diameter of 13.2. The specimen is hence derived from an animal about twice the size of the common fox *Vulpes vulpes* adduced for size comparison. It could be matched with metacarpals of the striped hyena. This hyena is found mainly along the Nile but also in the desert. It invades cultivated areas at night to feed and drink. The Nagada find may be what is left of a nocturnal scavenger that came too near to a settlement. The same fate may have suffered the two animals, represented each by one find, in Merimde Beni Salama and Maadi. Hyena is also very rare in older sites along the Nile.

Hartebeest (*Alcelaphus buselaphus*)

Hartebeest is represented by a horn core fragment apparently derived from a young animal or a female. The fragment is about 75 mm long, has a subcircular cross section measuring about 16 x 17 mm at the cranial end and 21 x 20 mm at the other end. It exhibits a slight twist. These features are very different from those found on the horn core fragments of small livestock in the assemblages. No other remains of hartebeest were identified, although this antelope is rather common in the game bag of palaeolithic and epipalaeolithic people along the Egyptian Nile. In size postcranial remains of hartebeest fall between those of small livestock and cattle. If present they would have been easily detected and the virtual absence of hartebeest in the samples is not the result of difficulties in spotting this herbivore in our samples. Hartebeest appears now to be extinct in Egypt, but it survived until recently in vegetated areas of the Western Desert.

Dorcas gazelle (*Gazella dorcas*) (Plate 1, figure 4)

In the older collection gazelle is represented by the upper part of a rather small male horn core (75-7), a skull fragment with the base of a female horn core (KH3B-UL) measuring 13.2x15.9 (basal cross section), a distal metapodial fragment (KH3B-LL) and a distal portion of a first phalanx (75/3B-LL). In the 1981 collection from KH3 two postcranial fragments occur: an incomplete scapula and a proximal cannon bone. Among the few worked bones collected during the same season, a distal fragment of a gazelle cannon bone has been modified into a point. No other remains of gazelles were detected, although such remains can generally be told apart from those of small livestock, because of their size, morphology, slenderness and compactness. As in the case of hartebeest, this game animal, well known from the game bag of the older hunter-gatherers along the Egyptian Nile, is probably virtually absent from our assemblages, but a few poorly defined fragments of the species may have escaped our attention. These errors will not affect seriously our calculations of absolute and relative frequencies. *G. dorcas* is still found in Egypt, though excessive hunting has strongly depleted the populations. It occurs in desert biotopes where some water and succulent food is available and occasionally the animals come to the Nile to drink. They may become comparatively tame as has been recorded from oases where they come to the water during the drier seasons. Predynastic people had probably no difficulties bagging animals coming near their settlements, but gazelles are not recorded frequently from predynastic sites. An exception is El Abadiya 2 near Danfiq, but the relatively high number of gazelles at this site remains unexplained. Shawki Moustafa (1953b) published a short note on three gazelle burials from predynastic Wadi Digla, but the animals involved are juvenile goats (Boessneck *et al.*, 1989: 120). The senior author has also strong doubts concerning the identity of the quite numerous gazelle finds in the tombs excavated by Petrie and Quibell (see introduction). As said, dorcas gazelle was a favourite game of the palaeolithic hunters along the Nile and of major importance for neolithic people in the Western Desert (Gautier, 2001).

Dog (*Canis lupus* f. familiaris) (Plate 1, figure 7)

Canid remains occur in various sites. They include a cluster with a fragmentary skull and some postcranial remains collected in 1981 from the surface of KH4 and no doubt derived from one animal. A series of cervical vertebrae, some of which articulate, were excavated in a trench of KH3 in 1981 and a fragmentary ulna and radius excavated from that context in the same year represent two other animals. Other elements are separate finds, among which the preservation of a fragmentary tibia found on the surface (KH3-1978) compares well with that of the fox finds; it may be all what was left of a recent carcass. This is probably not the case of the KH4 surface cluster with the skull, as its preservation is different. Table 3 gives some measurements of the finds. All of these are about 1.2 to 1.4 times larger in linear dimensions than their homologues in the common fox (*Vulpes vulpes*) adduced for comparison, except the small distal humerus and a quite large metacarpal (KH4). Therefore most of the remains pertain to canids with a shoulder height of 40-50 cm. The fragmentary condition of most of the material renders identification, either as domestic dog or golden jackal (*Canis aureus*), difficult. This is not the case of the fragmentary skull found on the KH4 surface, for this skull compares very well with that of a recent Egyptian pariah or village dog in the Ghent comparative collection.

skull, Tr.D. between ectorbitalia	:	~46	(a)49.4
TR.D. condyles	:		(a)34.9
upper M2, L.	:	6,6	
atlas, max. TR.D.	:	68,2	
scapula, L. articular process	:	~21	
humerus, A.-P.D. prox.	:	29,6	
TR.D. dist.	:	~21	
mc3, L.	:	(b)76.5	
femur, TR.D. prox.	:	30,3	
tibia, TR.D. prox.	:	~29	
TR.D. dist.	:	~19	(b)20.9
phalanx 1, L.	:	(a)22.8	
TR.D. dist.	:	(a) 5.8	6,9

TABLE 3

Measurements of the canids at the Nagada sites. a: same specimen, b: same cluster/skeleton.

Canis aureus is still found in Egypt, but in northern Egypt small wolves may be present (see Ferguson, 1981). Canids, either dog or jackal, have been recorded in various predynastic sites, but reliable accounts of the finds are generally absent. According to the measurements, the dog described from predynastic Toukh (Gaillard, 1934) stood about 40-45 cm at the shoulders (Peters, 1986). Shawki Moustapha (1952, 1953, 1954) described three dogs from burials at predynastic Heliopolis, Maadi and Wadi Digla and one dog from the settlement at Maadi as *Canis familiaris aegyptiaca*. He does not provide measurements, but the skeleton from the Maadi cemetery has been completed later and derives from a slender individual of some 52 cm at the withers (Boessneck *et al.*, 1989). In the same publication other dogs from the same site are described as medium sized reaching a maximum size of 58-59 cm. A large sample of canid remains from Neolithic Merimde Beni Salama was identified as derived from «medium large» dogs, except one small calcaneum which might represent a golden jackal. Only a few of the Nagada measurements can be compared with those taken at Merimde Beni Salama. They exhibit a comparable range but the small distal humerus from Nagada derives apparently from an animal of the size of that represented by the small calcaneum in Merimde Beni Salama. In both cases we may be dealing with animals in the lower size range of the dogs, measuring perhaps somewhat less than 40 cm at the withers. The KH4 metacarpal, on the other hand, is much larger than its homologue from Merimde and underscores the large size of the dog represented by the surface cluster (55 cm?). In fact the animal may have been long-legged for its distal tibia is relatively slender (TR.D.: 20.9). The dogs buried at Adaima reached heights of some 41-52 cm. According to Boessneck *et al.* (1989) the observed variation in size of the early Egyptian dogs suggests restricted selection: the animals were mainly kept as guard dogs, but dog burials clearly indicate that the animals also meant other things to people. Dogs are the earliest domestic animal (see for example Nobis,

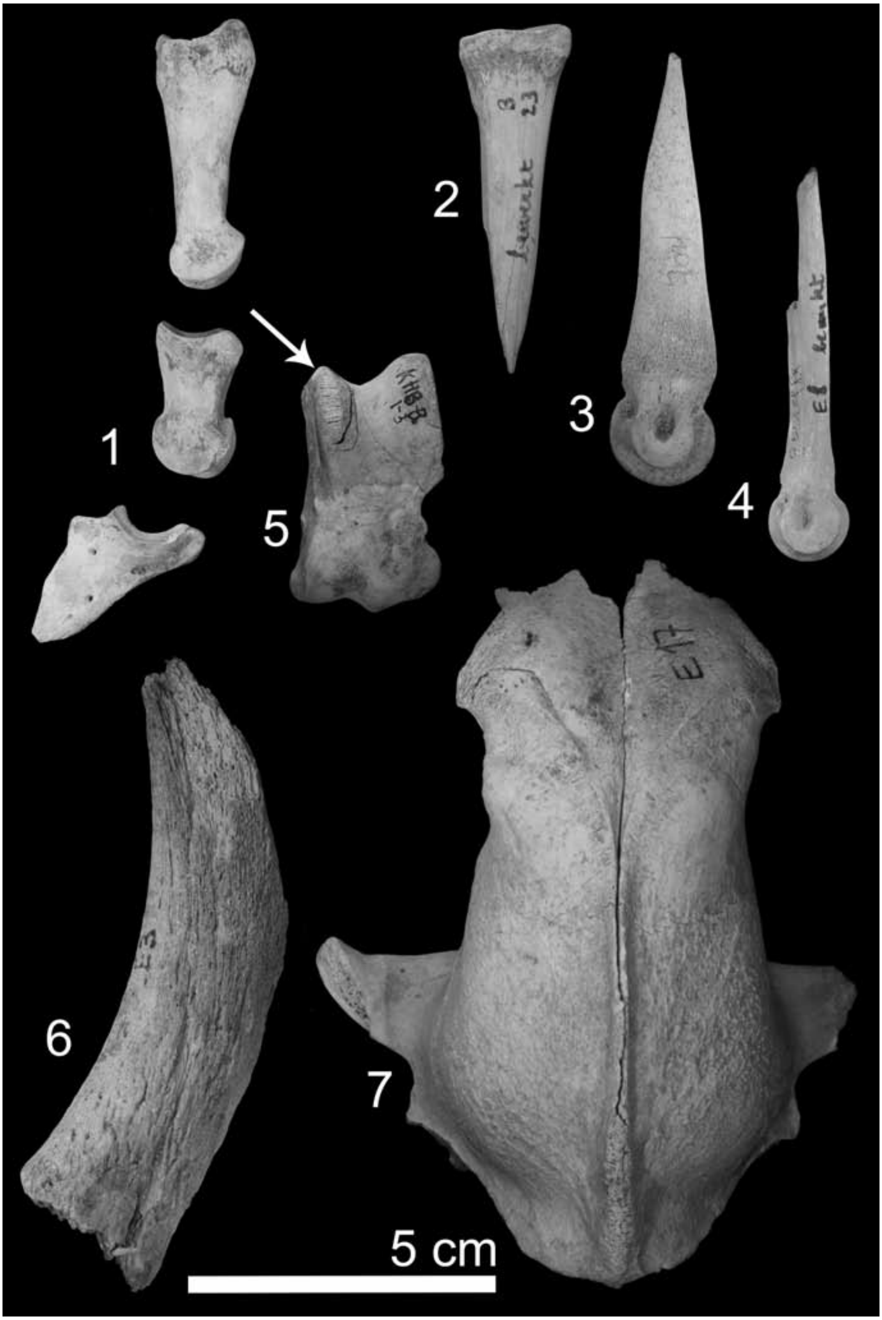


PLATE 1

figure 1: Coarticulating phalanges of sheep; 75/3C.
figure 2: Awl made on a proximal part of an anterior cannon bone of sheep; KH3 (1981).
figure 3: Idem on a distal cannon bone of sheep, KH3 (1981) (in pot).
figure 4: Idem on a distal cannon bone of dorcas gazelle; KH3 (1981).
figure 5: Astragalus of domestic pig with faintly visible traces of rodent gnawing on the proximal upper part; KH3B-UL (1981).
figure 6: Horn core of a screw-horned goat, KH3 (1981).
figure 7: Fragmentary skull of a large pariah-like dog; KH4.

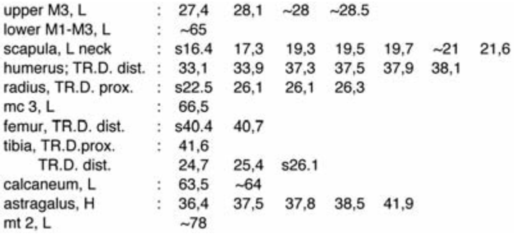
1979) and dogs are known from the Middle Neolithic in the Western Desert; in fact, they may have reached the desert together with sheep and goat (Gautier, 2002). Indirect evidence for the presence of dogs in our sites is provided by bone specimens showing clear traces of gnawing or ingestion by carnivores. Such traces may be produced by wild scavengers, but more probable by dogs living in the settlements.

Donkey (*Equus africanus* f. asinus)

A small equid is represented by a fragmentary lower cheek tooth found in a site tested in 1978: High Plain, site 3. As the meaning of the label is no longer clear, the specimen is not listed in Table 1. The find was encountered on the surface and no other osseous remains are associated with it, therefore the tooth might represent a recent addition to the site. However, its preservation is different from that of recent Egyptian donkey material in the Ghent comparative collection collected from the surface and the tooth appears to be larger than those of these donkeys. As exemplified by the finds from Maadi and from Abydos (Rossel *et al*., 2008), early donkeys of Egypt are quite large. Therefore we tentatively include the find with the Nagada domestic fauna. The donkey would have been domesticated in neolithic/predynastic times in Egypt. It occurs quite regularly in sites of the period, but being a beast of burden, its remains are rare among the many remains resulting from consumption. At Hierakonpolis, donkey as well as its wild ancestor is present among the buried animals.

Domestic pig (*Sus scrofa* f. domestica) (Plate 1: figure 5)

Pig is represented in most of the samples and the finds include fragments of the various elements of the skeleton. The pig of predynastic Toukh was originally described as *Sus scrofa* aff. *palustris*, that is, a pig comparable with the smaller domestic pigs found in the Swiss Neolithic lake dwellings (Gaillard, 1934). Measurements on some specimens from Toukh suggest pigs falling within the lower range of the Manching breed (Peters, 1986). Table 4 summarizes our own measurements. They have been compared with their homologues from Manching (Iron Age, Bavaria), Zambujal (Chalcolithic and Bronze Age, Portugal; von den Driesch & Boessneck, 1976) and Merimde Beni Salama. These exercises suggest that the Egyptian pigs may have reached about the size of their European cousins (60-80 cm at the withers), but were more slender as an adaptation to warmer and more arid conditions. Boessneck (1988) describes the Ancient Egyptian pig as a high-legged, slender animal with a long snout. As pigs appear to be frequent in early sites of the Delta (see further), it has been suggested that the marshy delta may have been a pig breeding centre in early Egypt (Menghin & Amar, 1932). Wild pig or boar has been recorded in the Delta and its local domestication is theoretically possible, but it seems more likely that its domestic relative was introduced from Asia as were sheep and goat (Gautier, 2002).



upper M3, L	:	27,4	28,1	~28	~28.5			
lower M1-M3, L	:	~65						
scapula, L neck	:	s16.4	17,3	19,3	19,5	19,7	~21	21,6
humerus; TR.D. dist.	:	33,1	33,9	37,3	37,5	37,9	38,1	
radius, TR.D. prox.	:	s22.5	26,1	26,1	26,3			
mc 3, L	:	66,5						
femur, TR.D. dist.	:	s40.4	40,7					
tibia, TR.D.prox.	:	41,6						
TR.D. dist.		24,7	25,4	s26.1				
calcaneum, L	:	63,5	~64					
astragalus, H	:	36,4	37,5	37,8	38,5	41,9		
mt 2, L		~78						

TABLE 4

Measurements of the pig remains at the Nagada sites. s: subadult.

Sheep (*Ovis ammon* f. aries) and goat (*Capra aegagrus* f. hircus) (Plate 1: figures 1-4 & 6)

Small livestock is represented by cranial as well as various postcranial remains in most of the samples and investigated loci. The distinction between sheep and goat was made with the aid of Boessneck *et al*. (1964). The overall ratio goat/sheep would be about 3:1. In some assemblages sheep appears to be much less abundant, but in most cases the number of identifiable specimens is very limited and therefore of little significance. Twenty-one skull fragments could be assigned to species: 11 to goat and 10 to sheep. The best preserved specimens were sent to the late Dr. Joachim Boessneck (Institut für Paläoanatomie und Geschichte der Tiermedizin, Munich University), who confirmed the identifications and added some comments in a letter dated 23.11.1981. The goats carried horns, but one small and not fully grown specimen may have been hornless. However, as stressed by Dr. Boessneck the skull shows an abnormal parietal suture. Perhaps the development of the animal was aberrant. The five best preserved specimens match well the homologous parts of recent screw-horn goats from the Canary Islands in the Ghent comparative collection and can be ascribed to the Ancient Egyptian screw-horn goat (Plate 1: figure 6). Other remains derive from young animals or are not diagnostic. The sheep skull fragments are too fragmentary to allow description of the horn cores, but the latter diverge markedly from the sagittal skull axis. Three fragments of adult cores seem to derive from screw-horned animals, but one specimen seen by Dr. Boessneck might in his view derive from an animal with ammon-horns, that is, normal spiral horns without a twist. He adds, however, that the morphology of the horns of early Egyptian sheep may be quite variable. Four fragments exhibit the characteristic depressions of hornless sheep and represent no doubt ewes. The other finds derive from young animals, two of which compare quite well with finds from the neolithic Fayum (Gautier, 1976: 376, fig. I-1, a, b).

Predynastic goats from Toukh were originally identified by Gaillard (1934) as *Hircus mambrinus* and *Hircus reversus*, that is, goats resembling the mamber goat originally described from Palestine, and the African dwarf goat. Peters (1986) established that no dwarf goat remains occur among the original Toukh material he reanalysed, but that the available finds can be attributed to the Ancient Egyptian screw-horn goat. Boessneck (1988) describes this goat as a short-haired, slender, quite large breed with generally tightly twisted horns, but animals with much less torsion of the horns are known as well as hornless individuals of both sexes. Early representations show mostly animals with pendulous ears, but later erect ears prevail. Interbreeding with goats imported from the Levant during the pharaonic period may have added to the variability of the Ancient Egyptian goats. The sheep of predynastic Toukh were originally recorded as *Ovis longipes palaeaegyptiacus* by Dürst & Gaillard (1902). Boessneck (1988) describes this original breed as high-legged with widely diverging, tightly twisted horns and a hair coat. According to him, hornless ewes were not frequent but our Nagada finds suggest that they may have been quite common. As in the case of the goat, interbreeding with animals imported from the Levant may have contributed to the variability of the sheep in pharaonic times. In the course of the Middle Kingdom woolly sheep with ammon horns arrived in Egypt and replaced the hair sheep. The fact that the early sheep and goats belong to hairy breeds may explain why earlier Ancient Egyptian people did show little preference for sheep and in several predynastic contexts goats seem to predominate. Their frugal diet may help to understand their high frequencies. The disparity between the sheep/goat ratio based on the Nagada cranial remains (1:1) and that derived from the postcranial remains (1:3) is no doubt due to differential preservation of the more compact horn cores of goats with respect to those of sheep and loss of hornless and more fragile skulls of ewes.

Some measurements are summarized in Table 5. They give the impression that the Nagada goats were smaller than the sheep, especially when one considers that goats often tend to be sturdier than sheep. The range of the transverse diameters of sheep compares with that of the Manching sheep. The length measurements, admittedly few in number, suggest the presence of larger animals. The estimated stature of the Manching sheep varies between 62 and 75 cm. Taking into account the probable slender built of our sheep, they may have reached greater sizes than their German equivalents. A few total lengths of long bones attributed to sheep can be converted into height at the withers with the aid of the known conversion factors, although these may not apply well in the case of long-legged sheep. The results obtained are: 66 cm (metatarsus), 68 cm (metacarpus), 69 cm (subadult tibia), 74 cm (femur) and 76cm (young adult metacarpus). A subadult caprine metatarsus may derive from an animal of some 65 cm. According

		goat	sheep
scapula, TR.D. neck	:	(2) 14.4-18.0	(10) 14.2-24.3
humerus, TR.D. dist.	:	(6) 25.7-30.8	(9) 27.6-31.4
radius, TR.D. prox.	:	(3) 25.3-~29	(5) 31.3-32.6
mc, L.	:		(2) 140-156
TR.D. prox.	:	(7) 19.7-24.7	(2) 26.0-26.9
TR.D. dist.	:	(3) 21.5-25.0	(7) 25.6-27.6
femur, L.	:		(1) ~210
tibia, L.	:		(1) ~222
calcaneum, H.	:		(3) 49.6-~64
mt, L.	:		(1) ~145
TR.D. prox.	:	(1) 20.6	(2) 22.2-26.6
TR.D. dist.	:	(1) 22.1	(3) 22.1-25.5
ph.1, L.	:	(1) 36.8	(14) 35.2-49.6
ph.2, L.	:		(4) 22.4-26.8
ph.3, L.	:	(1) 33.2	(1) 34.5

TABLE 5

Measurements of the goat and sheep remains at the Nagada sites. Number of measurements are given between brackets.

to Boessneck (1988) ewes of the Ancient Egyptian screw-horn sheep reached some 62-75 cm at the withers. Males and castrates would hence have reached 8o cm and perhaps a bit more. For goats the same author gives a total range of 59-75 cm or more; he also refers to dwarfed animals reaching 55-57 cm as a separate category, but does not explain why. These small animals should perhaps be included in the major group.

Two ovicaprid remains show pathological changes. A fragmentary innominate bone has a perforated acetabulum and a not healed fracture of the ventral rim of the acetabulum. A distal portion of a large tibia carries marked exostoses at the articular end suggesting a diseased joint of the tibia and ankle bones.

Cattle (*Bos primigenius* f. taurus)

Cattle remains occur in most samples of almost all of the investigated loci, and all parts of the skeleton were identified. Measurements of the better preserved specimens are brought together in Table 6. Most measurements fall within the upper range of the cattle from the aforementioned German site of Manching. The length of the patella and the complete first phalanx exceed the maxima recorded in Manching. As in the case of sheep, our comparisons suggest slenderly built animals; they may have reached 105 to 130 cm at the withers. About their horns nothing much can be said, since the collection contains only an incomplete horn core (KH3 1978), a fragment of another larger horn core and a small, juvenile horn core both collected in KH3 in 1981. The incomplete horn core has a subcircular basal cross section (42x41) and an estimated length along the outer curve of 160 mm or some more. Boessneck *et al*. (1989) measured nine horn cores from predynastic Maadi, attributing six specimens to longhorns, mainly cows, but a shorthorn cow and two females with horn cores of intermediate length would also be present. However they do not offer a definition of longhorns. In the classification proposed by Armitage & Clutton-Brock (1976), the Maadi horn cores would derive mainly from medium to short horned animals and the Nagada find would be a medium horned animal, most likely a cow. Other early finds of long horns come from Merimde Beni Salama (see further). Boessneck *et al*. (*ibid*.) consider that the observed differences in the horn core lengths and morphology found in Maadi reflect the normal variability in cattle populations not subject to marked selection.

upper M1-M3, L.	:	(a)73.3							
upper M3, L.	:	(a)29.8							
lower P2-P4,L.	:	~50	~55						
lower M3, L.	:	~38							
scapula, L. neck	:	52,8							
humerus, TR.D.dist.	:	68,1	74,2	~78	78,8				
radius, TR.D. prox.	:	~65							
TR.D. dist.	:	~72							
mc, TR.D. prox.	:	48,1	51,5	52,1	54,2	58,9			
TR.D. dist.	:	53,1	~54	~56					
femur, TR.D. dist.	:	~77							
patella, H.	:	74,1							
tibia, TR.D. dist.	:	56,8	57,9	~58	61,1				
calcaneum, L.	:		(a)127.2						
TR.D.	:	36,7	(a) 38.5						
astragalus,H.	:	62,1	62,3	~64	64,5	~66	70,2	70,4	73,5
mt, TR.D. prox.	:	48,4	49,8						
TR.D. dist.	:	55,1	58,8						
ph. 1, L.	:	56,9	62,4	64,1	70,2				
ph. 2, L.	:	34,2	37,9	~38	~39	40,1	40,7	42,3	
ph. 3, L. sole	:	59,3	63,2	63,1	72,6				

TABLE 6

Measurements of the cattle remains at the Nagada sites. a: same specimen.

Boessneck (1988) underscores the economic and cultural importance of cattle for the Ancient Egyptians. Their cattle were originally described as *Bos africanus*. The animals are typically long horned, long legged and exhibit a slender built (see also Laudien, 2000). They may have attained a height at the withers of 120-140 cm, males reaching as much as 150 cm. Their pre-pharaonic ancestors, found in neolithic and predynastic sites, either as consumption refuse or in burials such as in Hierakonpolis, appear to be smaller, because, as said, selection was not marked. However, in the Delta, at sites such as Buto and Maadi, long horned individuals reaching as much as 140 cm at the withers were recorded. Our Nagada finds appear to be smaller, perhaps reflecting less favourable feeding conditions. Gaillard (1934) ascribed the large bovid finds from Toukh to *Bos brachyceros*, a short horn cattle of rather small size, and to *Bubalus* aff. *caffer*, a buffalo related to the extant African buffalo, but all the finds can be ascribed to cattle with an average size slightly over that of the Manching cattle. Buffalo is not a member of the Quaternary game fauna along the Egyptian Nile (Gautier & Muzzolini, 1991).

Evidence has been accumulating that *Bos africanus* is the result of an independent and early domestication of the African aurochs. Early colonists in the Western Desert may have brought wild cattle to the desert and thus have started a domestication process during the Early Neolithic of El Nabta and Bir Kaseiba (Gautier 2001, 2007). Later these autochthonous cattle, together with sheep and goat introduced from Asia, came to the Nile Valley. Evidence not considered in the papers mentioned concerns the principal component factor analysis of early cattle from southwest Asia and Lower Egypt indicating two groups with a distinct origin (Buitenhuis, 1984); this corroborates the hypothesis that even the cattle of Lower Egypt would have had African roots.

One cattle find shows pathological signs that are difficult to describe: a posterior fragment of an edentulous mandible showing evidence of periodontal disease and abnormal dental roots. No other pathological changes were seen. Van Neer (2002) draws attention to the fact that pathological changes in the legs of cattle used regularly as draught animals are not well documented at Adaïma and suggests that cattle were not put to work intensively and until reaching an old age.

TRACES

As the finds are very fragmentary and weathering is marked, traces are not frequently preserved in easily recognisable form. Traces related to people, either directly or indirectly, include stigmata resulting from butchering, consumption and exposure to fire. Few such traces were observed, but those found are very clear. They consist of sometimes repeated short grooves on various skeletal elements of livestock. Iron knife cuts would be fine and deeply incised with a V-shaped cross section. Similar traces produced with stone tools are repetitive and coarser with a U-cross section (Guilday *et al*., 1962). Most of the cuts observed are coarse with a rather broad V-profile or a U-profile. No doubt they were produced during the dismembering of carcasses with stone tools. Only a limited number of bones exhibit brown to whitish discolorations due to exposure to fire. Shrinkage and warping as a result of prolonged exposure are rare. As fire traces are found on an assortment of remains, they are most likely caused by accidental burning of waste.

Traces due to animals include gnawing marks left on several bones by rodents (Plate 1: figure 5). A few bones exhibit isolated punctures caused by the crunching teeth of carnivores or evidence of pitting and dissolution typical for bones regurgitated by these animals or evacuated in their coprolites. As said, these traces most likely are due to dogs scavenging on available leftovers and garbage. A coprolite (KH3-1981; diameter c. 8mm, length c. 32 mm) is composed mainly of hair and quite a few remains attributable to small rodents. It may have been produced by a dog, but reminds the senior author of the recent coprolites he saw in the Western Desert far away from human settlements, thus undoubtedly due to wild canids such as fox or jackal.

Evidence of bone working is found in various samples (South Town, KH3, 75/3A). The original report by the senior author refers to worked bone specimens derived from goat or sheep cannon bones, of which the proximal or distal end were modified into awl-like tools and needles, but these artefacts are no longer present in the collection; no doubt they were sent to Dr. F. Hassan to be added to the artefact collection. The worked bones in the 1981 collection consist of nine awl-like tools made mainly on sheep cannon bones. In one case, already reported, the distal end of a gazelle cannon bone was turned into an awl (Plate 1: figures 2, 3 & 4). Gazelle is decidedly not frequent in the samples and no doubt people preferred «wild» bone for making artefacts, because it is more compact than that of domestic animals. Comparable awl-like tools have been found in contexts widely separated in time and space and the type has been catalogued as «poinçon sur métapode fendu de petit ruminant» (Camps-Fabrer, 1990). Recently recorded predynastic finds include awls found in a basket in a grave in Hierakonpolis (Friedman, 2003) and in El Abadiya 2 (Vermeersch *et al*., 2004: 261-262, fig 37). The collection is completed by a fragment of a longer, probably needle-like artefact most likely also made from an ovine cannon bone. Waste products in the older collection no longer available consist of cannon bone fragments with deep grooves parallel to the bone axis. No doubt bone tools were generally produced by what has been called the «method of grooving and snapping» (Guilday *et al*., 1962).

TAPHONOMY

As in most sites, the remains can be fit into various taphonomic categories, that is, groups of remains which travelled along comparable paths from the period of the death of the animals involved to the sampling of their remains. The animals involved and their known uses by people, the traces found and the contexts generally suffice to make the divisions (Gautier, 1987b). The major group consists of the consumption offal, including the fish, soft-shelled turtle, some of the birds, hare, hartebeest, gazelle, pig, sheep and goat, and cattle.

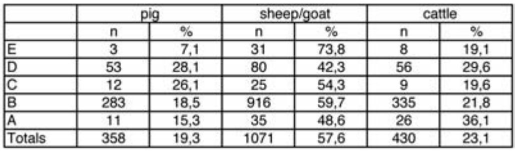
The workshop finds comprise the ostrich egg fragments, the worked bones and the larger freshwater bivalves, be it that these animals were eaten before their shells were put to some use. The pre-neolithic hunter-gatherers of the Egyptian Nile Valley collected *Unio abyssinicus* as food, but this mussel became extinct in the Nile in Holocene times (Gautier, 1987a). People may have switched to *Chambardia* as food and Boessneck & von den Driesch (1992) assume that the naiad was indeed on the menu in pharaonic ed Dab'a. They refer to Jickeli (1875: 261-262), but this malacologist found only one Greek consumer of the naiad; he collected it from a swampy pool near Gizeh. The senior author also wonders how tasty this mud-dweller is: many other mud- dwelling bivalves are eaten only in periods of famine, as already pointed out by Gaillard (1934: 108). In view of the foregoing, the *Chambardia* from our and other sites may not represent consumption remains «recycled» for making artefacts. The dog finds fit well in the carcass category: animals that died on the sites and of which the remains were not removed by the people. The hyena can be added to this group. Intrusives are remains of animals which reach a site by their own means or unintentionally through the action of man. Reworked intrusives include the smaller freshwater shells which are fossils from the deposits on which the sites were formed. In our sites, the main intrusives are penecontemporaneous intruders arriving on the sites during their occupation or about that time: amphibians, lizards, perhaps some birds and rodents. Some of these creatures may even be late intrusives, that is, animals that came to the sites much later; rodents in particular seem to like burrowing in archaeological deposits. Referring to the fact that in many regions with malnutrition in Africa and elsewhere small rodents are captured by women and children, von den Driesch & Boessneck (1985) suggest that part of the many small rodent finds in Merimde Beni Salama may derive from consumed animals. The suggestion has been repeated for the rodent finds of Buto. Consumption seriously affects the preservation of small rodents and hence the finds derive no doubt predominantly from intrusives. Moreover in our sites the colour of the small rodent finds is quite different from that of the typical food remains, suggesting another taphonomic origin. The surface finds of domestic donkey and fox may also be late intrusives.

Intentionally buried animals form a special category and in our case include at least part of the remains of sheep and goat from the first excavation in South Town. Another special category includes the animal contents of a pot excavated in 1981. They consist of a subadult caprine metatarsus and an articulating tarsal, the remains of a pair of tibias and of an ovine metatarsus, representing at least a goat and a sheep, as well as an awl made on a distal sheep metatarsus (Plate 1: figure 3). It is possible that some other remains now assigned to the consumption refuse category come from ill preserved or disturbed special contexts not recognized during the excavations or not well indicated on the faunal labels.

PALEOECONOMY

Table 1 indicates clearly that pig, sheep and goat, and cattle provided most of the animal foodstuffs. The limited quantity of large bivalves such as *Chambardia* and *Etheria* did not add much to the diet, if indeed these animals were eaten and not collected but for their valves to be modified into artefacts. Hunting of feathered game and game on the hoof was also restricted. Comparable deductions apply for most other neolithic and predynastic sites. As to the fish, it is difficult to quantify their exact contribution to the diet, but judging from the number of bones, fishing was a common subsistence strategy. This is especially the case when one takes into account the loss of fish remains that must have occurred because sampling was restricted to hand picking and sieving on a 4 mm mesh. The species spectrum includes mainly fish that prefer shallow water, e.g., the clariid catfish, the tilapia and the cyprinids, as well as species that are typically found in open, well oxygenated waters, e.g., the Nile perch and the *Bagrus* catfish. The habitat preferences of the fish hence indicate that both the main Nile and the floodplain were exploited (Van Neer, 2004).

Table 7 summarizes the absolute frequencies of the main livestock for the whole collection as well as for the assemblages of the chronological sequence, together with the corresponding relative frequencies or specific ratios, taking into account only the finds due to consumption. The results for the combined assemblages are: 19.3% (pig), 57.6% (sheep and goat) and 23.1% (cattle). The percentages for the total collection, that is including the consumption refuse without chronological attributions, are not given but differ only slightly. Dietary ratios can be estimated by multiplying



	pig		sheep/goat		cattle	
	n	%	n	%	n	%
E	3	7,1	31	73,8	8	19,1
D	53	28,1	80	42,3	56	29,6
C	12	26,1	25	54,3	9	19,6
B	283	18,5	916	59,7	335	21,8
A	11	15,3	35	48,6	26	36,1
Totals	358	19,3	1071	57,6	430	23,1

TABLE 7

Main livestock frequencies in the Nagada chronological sequence (specimens counts).

absolute frequencies with average dressed carcass weights and converting the results into percentages. We have used the carcass weights proposed by Nobis (1965) for primitive European livestock: 38 kg (pig), 15 kg (sheep and goat) and 100 kg (cattle). The exercise for the combined assemblages demonstrates beyond doubt that, because of their much greater weight, cattle were the main provider of protein and other animal food for the Nagada people: 18.7% (pig), 22.1% (sheep and goat) and 59.2% (cattle). Comparable results can be calculated for the separate chronological assemblages.

Age estimates based on jaw fragments or teeth was possible for a restricted number of specimens. They suggest that pigs were more frequently killed before their wisdom teeth became functional (7 cases out of 13) than sheep and goat (18/55). This indicates probably, as in other sites such as Maadi, el Abadiya and Adaïma, that the small ruminants were probably already kept for their secondary products such as milk and perhaps their hair, but up to now no early textiles made of fibre of sheep or goat are known and woven goat and sheep fragments are known only since the Middle Kingdom; real wool has been identified in New Kingdom contexts (Dr. J. Jones, Department of Ancient History, Macquairie University, Sydney, pers.com.). The few aged cattle remains suggest an exploitation more comparable with that of pig, but the sample may be biased because of its small size (5/6).

The sites were occupied permanently, but some activities were no doubt concentrated during certain periods of the year. All the freshwater molluscs thrive along the main channel of the Nile and *Chambardia* or *Etheria* were most easily collected when the Nile was low, that is, in the first half of the year. The heron, crane and quail, being migratory birds coming to Egypt or passing through it, would have been killed in fall, winter or spring. However, the low numbers of large bivalve and bird finds suggest that people practised neither shell collecting nor fowling assiduously. As to the limited mammalian game and the domestic animals, they do not provide seasonal clues. The best seasonal indicators are the fish remains. They show that fishing may have been practiced almost all year round, but that people concentrated on different taxa depending on the season. The Nile perch, bagrid catfish and possibly also the *Synodontis* were caught in the main river (Van Neer, 2004). Most likely the larger Nile perch were captured mainly when the Nile waters were relatively low and less turbulent, allowing easier access to the deeper parts of the river where the larger fish can be found. In late summer, when the waters rise and the floodplain is flooded, a massive lateral migration occurs of fish heading for the marginal areas to spawn. At the beginning of the spawning season, clariid catfish occur massively in shallow waters and can easily be captured by simple wounding or striking gear (cf. classification of fishing methods in von Brandt, 1984), and even by hand. The spawning of the clariids lasts only for a few days and afterwards they disperse in the deeper waters of the flooded plain. However, during the entire flood season, tilapia are found in inshore waters. They are repetitive breeders that build conspicuous, circular nests in which they guard their young. When the waters start receding, residual pools may form on the floodplain. The extent of these pools, and hence the time they will contain water, depends on the local topography of the floodplain. In such pools fish are trapped that did not migrate in time to the main river while the waters were lowering. The fish in these residual pools comprise many juveniles and therefore the average size of the animals is smaller than that of fish captured at the beginning of the flood season. The material from the Nagada sites did not yield the numerous small tilapia and *Clarias* that would be expected if residual pools were exploited, but this can simply be a result of sampling bias.

THE NEOLITHISATION OF NILOTIC EGYPT

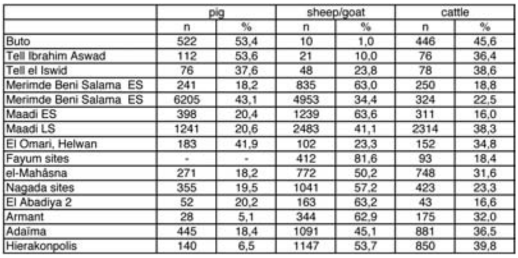
The specific ratios in Table 7 calculated for the chronological assemblages do not show a clear trend. As pointed out in the introduction, assemblage E comes from a looted cemetery and the composition and age of the assemblage may be equivocal. Changes in the ratios calculated for some loci of the settlements have been adduced in preliminary papers in support of the gradual influx of pastoralists from the eastern Sahara in the Nile valley and a gradual shift of the husbandry in response to the ecological conditions of the valley, resulting in an increase of cattle and pig (Hassan *et al*., 1980; Hassan, 1981, 1984). Pig seems to increase in the settlements but the other livestock does not show the postulated commitant trends. According to Redding (1992) pig may have been a resource for local consumption linked principally to rural communities. The low frequency of pig in the late assemblage E may therefore reflect its more advanced socio-economic status, but in the A-D sequence pig would suggest on the contrary increasingly more rural conditions. Most likely the observed differences are aleatory due to uneven sampling.

In retrospect it appears quite understandable that our sites do not provide evidence for the suggested gradual adjustment. A limited number of generations would no doubt suffice for such an adjustment during the neolithisation of the valley. The earliest known Nilotic site in Upper Egypt of which the fauna and livestock were analysed in detail is the Badarian site of Maghar Denderah 2 (Hendrickx *et al*., 2001). Radiocarbon dates place the occurrence and the Badarian between 4400-4000 cal BC, but thermoluminescence dates suggest that the Badarian presence in the Nile Valley may date back to 5000 cal BC. Badarian ceramics exhibit strong links with the Late and Final Neolithic of Nabta and Bir Kiseiba in the Western Desert, spanning the period about 5400-3300 cal BC (Wendorf & Schild, 2001). The Badarians may have been originally based in the desert and may have settled in the valley in a later stage (Hendrickx, 2006). Maghar Denderah 2 is not a permanent site and in the view of the senior author it may illustrate that some Badarians had retained the nomadic traditions of the desert. Holmes (1999), summarizing the available evidence records that the Badarians cultivated barley and emmer wheat and had sheep, goats and cattle. Pig seems to be absent, although it was already present in northern Egypt (see below).

As for northern Egypt, the oldest sites near the valley with livestock are those of the Fayum A or Fayumian people (5000-4000 cal BC; see bp dates in Brewer, 1989). Their herds comprised mainly the smaller domestic ruminants and some livestock (Gautier, 1976; von den Driesch, 1986; Brewer, 1989), but unpublished analyses (Dr. Redding, Museum of Anthropology, University of Michigan, Ann Arbor, pers. com.) confirm the presence of a few pigs, also recorded by Caton-Thompson & Gardner (1934). Merimde Beni Salama on the western edge of the Delta is the other site with early livestock in northern Egypt. Pig, sheep, goat and cattle are well established in the earliest occupation of the locality; dates for the five recognized occupation phases range from about 4800 to 4200 cal BC (Eiwanger, 1999). The pottery of this occupation appears to be related to that of the Early Neolithic of southwest Asia and the simplest proposition brings all their livestock directly from Asia. After a period of abandonment the site, marked by eolian deposits, was reoccupied by people having more African ties (Eiwanger, 1999; Hendrickx, 1999) and we can ask from where their livestock came. Early domestic cattle of southwest Asia are said to be short horns (Laudien, 2000: 109). Longhorns have been identified in Merimde Beni Salama and were adduced as evidence for the African origin of cattle at the site (Gautier, 2001, 2007), but no distinction was made between the early and later occupation of the site. However, the longhorns derive from the later occupation. The foregoing is not in contradiction with the hypothesis that Lower Egypt ultimately acquired cattle from the Western Desert as did Upper Egypt.

Along the Central Sudanese Nile adoption of livestock appears to be a rapid phenomenon beginning around 5000 cal BC (Gautier & Van Neer, in press). Cattle are decidedly much more frequent there than the small domestic ruminants. The more humid climate no doubt played a role in the observed difference with respect to Nilotic Egypt. Unfortunately the archaeological record of Nilotic Egypt exhibits a considerable gap between the latest hunters and foragers and the earliest known farmers and stock keepers. The latest epipalaeolithic sites (with some pottery) along the Nile are dated to about 5500-5000 BC (Tarifian; Ginter *et al*., 1985). The latest epipalaeolithic people in the Fayum seem to disappear around 7100 bp (Hassan, 1988: 143, table III), that is around 6000 cal BP. The neolithisation of Nilotic Egypt no doubt took place during the recorded hiatus and may predate that of the Central Sudanese Valley. According to Wendorf & Schild (2001: 674) the stone-covered tumuli, megalithic alignments, the calendar-circle and stone structures recorded in Nabta, point to Nabta as a ceremonial centre and to a complex pastoralist society during the late Neolithic (5400-4600 cal BP). Its members would have lived in a symbiotic relation with agricultural communities along the Nile. The foregoing implies neolithisation of the valley with introduction of domestic cereals from Asia and early livestock, in the view defended in this paper acquired from the desert herders perhaps going back to ca. 5400 cal BP. This hypothesis differs from the one advanced by Hendrickx (2006) according to which the Badarians were originally desert dwellers and settled in the valley only late. Riemer & Kindermann (in press) suggest that already between 6000 and 5300 BC hunter-gatherers with some livestock (called «pastro-foragers» by Riemer, 2007) from the Western Desert between the curve of the oases from Bahariya to Kharga and the Nile came annually to the river during the dry season of their desert homeland. Anyhow, the neolithic and predynastic of the valley cover a long period spanning some 2000 years or more. Major cultural changes were slow and the Nagada sites do not tell us anything about the impact of people immigrating to the Nile from the desert. Perhaps there was an early period during which Nilotic Egypt saw hunter-gatherers, visiting pastro-foragers and early agricultural villages, who are now for ever invisible.

Table 8 compares the frequencies of the main livestock in our sites with comparable frequencies calculated for other permanent neolithic and predynastic sites in the Nilotic environment. For Merimde Beni Salama these frequencies are given separately for the early and later occupations. For Maadi, two sets of ratios are available which differ quite markedly in the proportions of sheep and goat versus cattle; this difference seems to reflect a shift of the site to the west and excavations in the earlier occupation later followed by excavations more to the west; with time Maadi became a more important trading post (Caneva *et al*., 1987; Van Neer, 1999), and cattle apparently acquired greater importance. The Fayum A data combine the published analyses from various sites. At Hierakonpolis some differences in the assemblages from the three loci analysed may be due to specific activities at these locations. We have combined the data of Hierakonpolis, thus hoping to reduce sampling bias. The recorded quantitative differences and our manipulations underscore the uneven value of the obtained ratios. Anyhow, for El Abadiya 2, the site immediately south of our sites, the percentages compare quite well with ours. In our sites, pig and cattle would have comparable importance, but in the sites of Lower Egypt, especially in the Delta, pig is generally more frequent, cattle being also better represented, while sheep and goat decrease, becoming quite inconspicuous in a few cases.



	pig		sheep/goat		cattle	
	n	%	n	%	n	%
Buto	522	53,4	10	1,0	446	45,6
Tell Ibrahim Aswad	112	53,6	21	10,0	76	36,4
Tell el Iswid	76	37,6	48	23,8	78	38,6
Merimde Beni Salama ES	241	18,2	835	63,0	250	18,8
Merimde Beni Salama ES	6205	43,1	4953	34,4	324	22,5
Maadi ES	398	20,4	1239	63,6	311	16,0
Maadi LS	1241	20,6	2483	41,1	2314	38,3
El Omari, Helwan	183	41,9	102	23,3	152	34,8
Fayum sites	-	-	412	81,6	93	18,4
el-Mahâsna	271	18,2	772	50,2	748	31,6
Nagada sites	355	19,5	1041	57,2	423	23,3
El Abadiya 2	52	20,2	163	63,2	43	16,6
Armant	28	5,1	344	62,9	175	32,0
Adaïma	445	18,4	1091	45,1	881	36,5
Hierakonpolis	140	6,5	1147	53,7	850	39,8

TABLE 8

The main livestock in permanent neolithic/ predynastic sites of Nilotic Egypt (specimens counts). References see Introduction. ES/LS: Early Settlement/Late Settlement.

These tendencies most likely indicate that pig and cattle found better living and feeding conditions in Lower Egypt. The marked shifts in the frequencies of pig and sheep and goat in the occupations of Merimde Beni Salama may reflect fundamental differences in the early versus the later occupations. The absence of pig in the Fayum no doubt reflects the general desert-like conditions of the environment, which also explain the marked dominance of the small domestic ruminants. The general impression is that all the sites pertain to rural communities already well adapted to the conditions of their environment in Nilotic Egypt, showing some faunal changes due to local socio-economic developments.

SUMMARY AND CONCLUSIONS

As expected, the faunal spectra of the Nagada sites compare well with the already known spectra from other neolithic and predynastic sites in Nilotic Egypt and comprise the same taphonomic groups. The consumption remains derive from freshwater fishes, soft-shelled turtle, some wild birds and mammals, and the classical quartet of pig, sheep, goat and cattle. The sheep and the goats apparently belong to the Ancient Egyptian screw-horned breeds which may have been more variable than the existing descriptions suggest. The cattle were probably smaller long horns of the *africanus* type. Ostrich egg shell, the large freshwater bivalves *Chambardia* and *Etheria* as well as some remains of worked cannon bones, mainly from sheep, exemplify the use of animal materials for making artefacts. The cowry is an artefact testifying to contact with the Red Sea. The dog finds suggest animals of some 44-55cm at the withers and derive most likely from carcases of animals that died on the sites. The smaller freshwater molluscs represent intrusives reworked from the fluviatile deposits on which the sites were formed. Penecontemporaneous, but perhaps also late intrusives include the herpetofauna and the various rodents. The single finds of domestic donkey and fox may be late intrusives. The counts indicate that the major animal food resources are the fishes and the livestock quartet. Sheep dominate the quartet, but because of their size, cattle are the main meat providers. Birds (and ostrich eggs?) and wild quadrupeds did not add much to the diet, while the collected large bivalves may not have been eaten at all. Evidence for seasonal activities and a distinct annual round is scant. Fishing may have been practiced almost year round with probably the highest yields at the beginning and the end of the flood season. It would seem that agricultural and pastoral activities dominated the life of the Nagada people, as was probably also the case in the other permanent neolithic and predynastic settlements along the Nile valley. The impression is they all belong to already well established rural communities not testifying to the neolithisation of Nilotic Egypt.

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