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# THE FAUNAL REMAINS FROM NADAOUIYEH AÏN ASKAR (SYRIA). PRELIMINARY INDICATIONS OF ANIMAL ACQUISITION IN AN ACHEULEAN SITE

**Nicole REYNAUD SAVIOZ**
Institute for Prehistory and Archaeological Science (IPAS) University of Basel, Switzerland, nicole.reynaud@aria-sa.ch

## Introduction

The open-air site of Nadaouiyeh Aïn Askar (Nadaouiyeh hereafter) is located in Central Syria, in the El Kowm area. Here a gap in the mountains separates the northern Badia from its southern part (Le Tensorer *et al.* 1997) (fig. 1). This particular region is characterised by the presence of numerous natural springs in an otherwise dry landscape (Jagher & Le Tensorer 2011). Water and oases have attracted humans and animals in all eras. Up to now, 186 Palaeolithic and Epipalaeolithic sites - flint-knapping workshops located in the hills and open-air settlements along the valleys and especially at the springs - are known from the El Kowm area.

Humans have regularly camped again and again at or next to the spring of Nadaouiyeh, from the Lower Palaeolithic to historical periods. The older part of this very long sequence, from about 525,000 to 350,000 years BP, is especially well represented. In total, 32 Acheulean levels, extremely rich in lithic artefacts, including more than 12,000 hand axes (Jagher 2000, 2011), and well over 14,000 faunal remains (Le Tensorer *et al.* 1997; Reynaud Savioz & Morel, 2005), have been recorded.

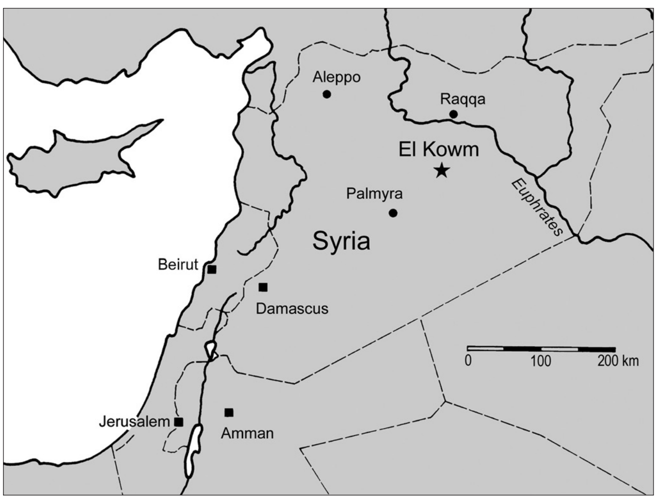


***Figure 1*** - Location of the El Kowm area (map R. Jagher).

The excavated surfaces cover less than 5 m² for half of the 32 Acheulean levels, and exceed more than 10 m² for just nine of the levels.

The particular setting of the site on top of a karstic system explains the occasional drying out of the spring at Nadaouiyeh (Turberg 1999). The action of groundwater is responsible for the formation of an extensive karstic vent and the periodic collapse of the underground cave system. These cave-ins created depressions on the surface of 30 to 50 m in diameter and from 5 m to well over 10 m in depth. During periods of low water table - when the Acheulean people resided near/at the spring - the majority of the sediments were deposited under limnic conditions (Pümpin 2003; Le Tensorer *et al.* 2007). Aeolian processes played a lesser role in the sedimentation process, accumulating ultimately a stratigraphy of over 30 m (for a more detailed description of the sequence and the geology, see Jagher 2011).

## Faunal remains

A detailed quantitative analysis of the faunal assemblage is still in progress, therefore the results have to be considered as preliminary. At the moment, individual data are available for 13.324 bones (fig. 2). Approximately 1500 pieces, mainly from the lowest levels excavated during the last years of field work, have still to be treated. 2205 faunal remains were determined specifically and anatomically during excavation before being eliminated, because of too poor preservation, impeding a reasonable recovery of the bones.

## Taphonomy and origin of bone accumulation

Fossilisation in most cases is poor, requiring a systematic *in situ* treatment with a monomer resin while unearthing, in order to stabilise the fragile animal remains. Unlike most open-air settlements, where bones rapidly deteriorate, the marshy depression offered excellent conditions for the preservation of faunal remains. Usually bones were rapidly buried in fine-grained sediments; in most levels, bone preservation indicates a fast sedimentation, which permitted the conservation of fragile bones,

| units | levels | Gazelle | Antelope | Aurochs | Camelids | Equids | Rhinoceros | Carnivores | *Sus scrofa* | Bird | Tortoise | Microfauna | gazelle-size | antelope-size | antelope/camel size | camel-size | indet | total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | c.1 | 2 | 1 | | 1 | 4 | | | | 1 | 1 | | 1 | | | 21 | 1 | **33** |
| | c.2 | | 1 | | | | | | | | | | 1 | 9 | | | | **11** |
| B | c.5av | | 1 | | 9 | 7 | | | | | | 4 | 8 | 12 | 16 | 91 | 3 | **151** |
| | c.6.1 | | | | 1 | 3 | | | | | | | | 2 | 8 | 26 | | **40** |
| | c.6.2 | | | | 1 | 19 | | | | | | | | 1 | 9 | 8 | 1 | **39** |
| | c.5-90 | 1 | 1 | | 35 | 6 | | | | | | | 4 | 8 | 34 | 182 | 25 | **296** |
| | c.5b | 2 | | | 70 | 3 | | | | | | | | 18 | 32 | 69 | 3 | **197** |
| | c.6a | | | | 42 | | | | | | | | | 11 | 21 | 98 | | **172** |
| | c.6.4 | 1 | | | 12 | 159 | | | | | | | 5 | 72 | 76 | 151 | 3 | **479** |
| | c.6b | | | | | 1 | | | | | | | | 17 | | 6 | | **24** |
| | c.7 supra | | | | | | | | | | | | | | | 2 | | **2** |
| | Ach III | | | | | 3 | | | | | | | | | | | | **3** |
| C | c.8.1 | 130 | 25 | 1 | 18 | 19 | | 1 | | 2 | 11 | 1 | 126 | 92 | 72 | 255 | 61 | **814** |
| | c.8.1a | 94 | 62 | | 1 | 9 | | | | | 2 | | 10 | 45 | 19 | 27 | 32 | **301** |
| | c.8.1b | 340 | 42 | 24 | 13 | 13 | | 1 | | 6 | 92 | | 119 | 46 | 20 | 95 | 262 | **1073** |
| | c.94-1 | 6 | | | | | | | | | | | 11 | 4 | | 12 | 7 | **40** |
| D | c.8a/d | 247 | 44 | 2 | 49 | 86 | | | 1 | 1 | 57 | | 101 | 92 | 644 | 379 | 92 | **1795** |
| | c.8a | 1120 | 149 | 7 | 82 | 67 | 2 | 3 | | 6 | 159 | | 392 | 222 | 68 | 663 | 353 | **3293** |
| | c.8b | 529 | 63 | 5 | 39 | 36 | | 3 | | 5 | 121 | | 205 | 127 | 39 | 170 | 195 | **1537** |
| | c.8b infra | 28 | 1 | | | 2 | | | | | 7 | | 1 | 1 | | 3 | 25 | **68** |
| | c.8c | 357 | 14 | 1 | 19 | 22 | | | | 5 | 263 | 1 | 66 | 25 | 14 | 58 | 145 | **990** |
| | c. 8c infra | 9 | | | 3 | 1 | | | | | 1 | | | | | 2 | 2 | **18** |
| | c.8d supra | 5 | | | | | | | | | 2 | | 1 | | | | 16 | **24** |
| | c.8d | 236 | 49 | 2 | 22 | 37 | 1 | 3 | | 3 | 225 | 2 | 48 | 34 | 19 | 104 | 87 | **872** |
| E | c.9 | 8 | 10 | | 18 | 69 | | | | | | | 11 | 22 | 6 | 226 | 75 | **445** |
| F | travertin | 56 | 1 | 2 | 19 | 5 | | 1 | | 1 | 3 | | 79 | 53 | 14 | 156 | 21 | **411** |
| | Dolina 3 | 5 | 5 | | 9 | 12 | | | | | 10 | | 10 | 11 | 25 | 104 | 5 | **196** |
| | **total** | **3176** | **469** | **44** | **463** | **583** | **3** | **12** | **1** | **30** | **954** | **8** | **1199** | **924** | **1136** | **2908** | **1414** | **13324** |

***Figure 2*** - General table of the faunal remains.

such as *scapulae*, and, in several instances, the preservation of complete braincases and even intact skulls of gazelles, camels and wild ass or intact carapaces of tortoise. Traces of heavy weathering were only occasionally observed, which is quite surprising in an open-air site. However, in some archaeological levels bones were poorly preserved, limiting identification. Post-diagenetic effects affected the animal remains: geochemical actions affecting not only bones but also stone artefacts (Pümpin 2003), and micro-tectonical movements during the various cave-ins of the karstic spring have often crushed, distorted and fragmented the bones (e.g. c.6.4 and c.9). Especially the long bones of large mammals and teeth were broken into several fragments, which were counted individually, raising their representation artificially. This effect of selective recognition is exemplarily shown by the numerous recorded remains of tortoise, which is almost only known by fragments of carapace, which is easily recognised by its characteristic structure even in tiny fragments.

Gnawed bones are extremely rare in all units (preliminary projections indicate less than 3%), no digested bones have been found despite the special attention they were given, and only two coproliths of hyena have been discovered (both in unit Nad-F). The hypothesis of fragmentation due to carnivores can therefore be rejected. Furthermore, the site of Nadaouiyeh is characterised by a high density of flint artefacts (Jagher 2000, 2011). Repeated observations demonstrate that the faunal remains and the lithic tools are associated, without doubt. Several living floors, preserved by a rapid sedimentation, were identified, and some particular horizontal distributions indicate specific activity areas. For example, the archaeological level c.5b (Nad-B) shows what was very likely a butchery zone (fig. 7). In lower archaeological levels (e.g. units C and D) most of the long bones were broken in a fresh state (in many cases with clear traces of impact of a heavy tool), obviously for extracting the marrow. Even the massive long bones of big animals, such as Equids and especially Camelids, have been reduced to small fragments of less than 10 cm. Cut marks indicating defleshing are occasionally observed (fig. 3). Besides filleting and marrow-processing, indicative of butchery and consumption activities, no evidence for fire places is present in any of the archaeological units. The distribution pattern of skeletal elements shows that gazelle, antelope, Equids and Camelids were brought as complete carcasses to the spring site (figs. 4, 8).

Taking all these observations into account, it appears reasonable to assume that humans were by far (if not exclusively) the major agent responsible for these bone accumulations. It can be stated positively that the faunal remains originate from human exploitation of the local fauna during repeated occupations.

***Figure 3*** - Nadaouiyeh Aïn Askar, level 5b (Nad-B), cut marks on the distal articulation of a camelid phalange, 1.5 actual size (photo E. Jagher).

## Taxonomy

As a whole in the Nadaouiyeh fauna, three species of Bovids are recorded; aurochs (*Bos primigenius*) (n=44), antelope (genus *Oryx*, very likely *Oryx leucoryx*) (n=469) and a gazelle (n=3176). The goitred gazelle (*Gazella subgutturosa*) has been identified with certainty in levels c.8a-d on the basis of horn cores (fig. 5). Among other herbivores are represented; rhinoceros (*Dicerorhinus mercki/hemitoechus*) (n=3), Camelids (n=463) and Equids (half-ass/ass and horse) (n=583). By the size of their teeth, the Equids can be divided into three groups: a very small one with affinities to *Equus africanus* (African wild ass) despite its inferior size; a clearly bigger species, probably *Equus hemionus* (Asian wild ass) and the third one, represented by just three teeth, is even bigger, and can be attributed to the *Equus ferus* group (Morel 1996). A pig (*Sus cf. scrofa*) is represented by a single fragment of a mandible. Carnivores are very rare and are represented by hyena (a fragment of mandible and some coproliths), lion (an isolated canine) and a fox-sized species (in all n=12). Some small birds (n=30) and a few remains of microfauna (n=8) complete the list of species, to which about 1000 remains of tortoise (n=954) have to be added. An unidentified elephant is represented by an isolated lamella of a molar, unfortunately discovered in a geological context with mixed archaeological material. Hence it remains undecided if it indicates the presence of such a pachyderm, or if the object was brought to the site as a curio by prehistoric man. Unspecified faunal remains were grouped into four size groups: the small-size class includes essentially gazelle-size bones; the medium-size group corresponding to antelope and Equid-size and the big-size group matching Camelids, aurochs and rhinoceros. The fourth group is an intermediate, between the medium- and big-size classes, for bone fragments too small to be attributed to either of them for sure.

Corresponding to its geographic setting, the Nadaouiyeh fauna comprises only animals associated with a more or less open

| Units | head | axial skeleton | scapular & pelvic girdles | limb bones | feet | total |
|---|---|---|---|---|---|---|
| **C 1** | 32 | 34 | 47 | 66 | 45 | **224** |
| **C 2** | 51 | 126 | 15 | 45 | 102 | **339** |
| **D a** | 266 | 119 | 35 | 239 | 454 | **1113** |
| **D b** | 110 | 105 | 25 | 100 | 188 | **528** |
| **D c** | 57 | 79 | 17 | 75 | 128 | **356** |
| **D d** | 28 | 39 | 13 | 62 | 93 | **235** |

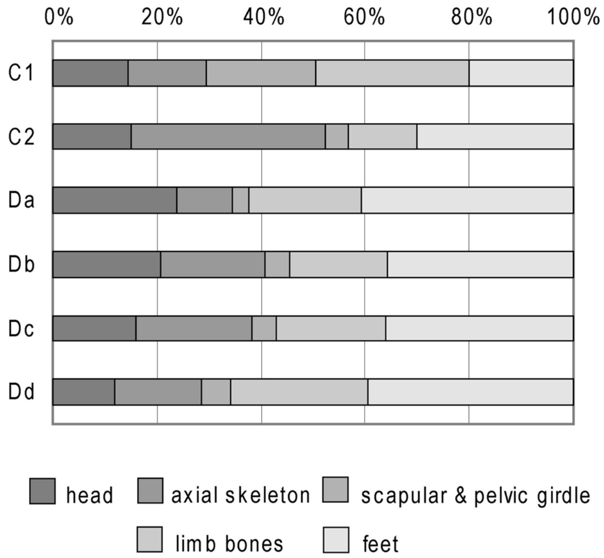


***Figure 4*** - Skeletal parts frequencies of the gazelle in the units Nad-C and Nad-D (diagram and table).

***Figure 5*** - Horn cores of goitred gazelle (*Gazella subgutturosa*) level c.8a. female (left) and male (right) (photo N. Reynaud Savioz).

steppe. Animals characteristic of woodlands such as Cervids are completely absent, as are the animals of the surrounding mountain ranges (e.g. Caprids). Ecologically, the Nadaouiyeh fauna is indicative of the same environment as is demonstrated by the palynological observations of J. Renault-Miskovsky (1998). As this steppe was predominantly treeless, remains of rhinoceros could be attributed to *Dicerorhinus hemitoechus*. Finds of fauna that are relatively older and younger than the Nadaouiyeh assemblage, from Hummal and Umm El Tlel in the El Kowm area, show the predominance of a fauna typical of a dry steppe throughout the Pleistocene (e.g. Griggo 1999; Frosdick 2010).

## The archaeological context

The 32 Acheulean levels at Nadaouiyeh have been grouped into seven archaeological units, labelled Nad-A to Nad-E (Jagher 2011). The abundance of faunal remains varies from one unit to another, partly depending on the excavated surfaces. Variations in taxonomic frequencies have thus to be taken with some caution (extensive statistical tests are still pending). In the following, the number of individual specimens (NISP) refers to bones identified to the genus level at least (fig. 6).

### *Unit Nad-F*

(>500,000 BP) NISP = 88
Among the small number of faunal remains specifically determined, gazelle is well represented, followed by Camelids, and Equids. From the 323 unspecified faunal remains, the dominant group (48%) is of big size, followed by small (24%) and medium-sized animals (16%).

In summary Camelid-size and gazelle-size animals occur in roughly the same proportion, together making up three-quarters of the material. The antelope-size group is insignificant and the Equid group is small. It is the only case in Nadaouiyeh where small- and big-size classes occur together as main components of the fauna.

### *Unit Nad-E*

(approx. 500,000 BP) NISP = 105
The preservation of the bones is poor due to a very strong secondary fragmentation by post- sedimentary geological and geochemical processes (Pümpin 2003). Equids, essentially represented by fragments of teeth, dominate with 66% of the NISP, followed by Camelids with 17%. If we take into account the unidentified bones attributed to the big-size group (66%), however, it appears that Camelids are clearly underestimated. Gazelle and antelope-size classes reach respectively 8% and 10%. Because of poor general preservation, the initial proportion of gazelle could be higher. However, among the unidentified bones, the presence of the medium- and big-size classes clearly show a strong preference for bigger animals in this unit. In synthesis it can be said that the Camelid-size animals clearly dominate the spectrum with more than half of the bones. The second class is the Equid group with nearly one-fifth of the material. Smaller mammals, i.e., of gazelle size, clearly play an inferior role.

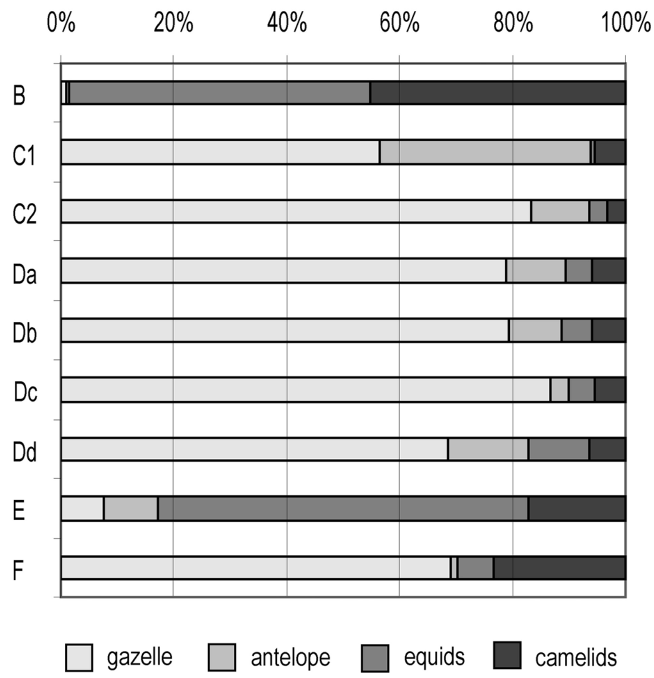


***Figure 6*** - Taxonomic abundance for archaeological units; bottom table with n, top graph for units with n >100.

### *Unit Nad-D*

(between 500,000 and 475,000 BP) NISP = 4204
Several actual living floors within this unit (e.g. c.8b and c.8d) yielded abundant and exceptionally well preserved faunal material. The bones and stone artefacts were covered rapidly by limnic and fine- grained alluvial sediments (Pümpin 2003). The faunal spectrum of all levels is clearly dominated by gazelle (60%) and followed by tortoise (20%). Much rarer are antelope (8%), Equids (6%) and Camelids (5%). Other taxa such as rhinoceros, carnivores, Suidae and small mammals, represent less than 1%. The proportion of the tortoise may be overestimated, as even tiny fragments of the carapace are easily recognised by their unique structure. Preliminary spatial analysis shows conspicuous concentrations of turtle remains, suggesting a much lower number of individuals.

### *Unit Nad-C*

(between 475,000 and 450,000 BP) NISP = 913
As in the underlying unit, the general preservation of bones is good. The gazelle still clearly dominates with 62% of the identified remains, and is followed by antelope (14%) and tortoise (12%). Other mammals represent less than 10%: Equids (4%), aurochs (5%) and Camelids (3%). As in unit Nad-D, the remains of big animals – 30% of the undetermined bones – are heavily fragmented, in general due to human activity.

Despite a strong archaeological discrepancy between units Nad-D and Nad-C (Jagher 2011), the palaeontological material shows a very close similarity of composition. Gazelle-sized animals make up two-thirds in each of the two units, while in both close to one-fifth are Camelid-sized animals, n antelope-size and  Equid-size make up around 10% each.

### *Unit Nad-B*

(between 430,000 and 350,000 BP) NISP = 381
This archaeological unit, comprising 10 archaeological levels with palaeontological remains, is characterised by a good preservation of bones, although some levels show a strong secondary fragmentation (e.g. c.6.4). Equids dominate with 53% of the NISP, closely followed by Camelids (45%). Gazelle represent just 1% and no fragment of tortoise has been found. This spectrum is conspicuously different from the older units. If one considers that 86% of the Equid remains are small fragments of teeth, whereas only 39% of the Camelid remains are teeth, and that 63% of the unidentified bones belong to the size-class big, the strong preference for Camels in this unit becomes evident. The infrequence of small animals of gazell size, is confirmed by the fact that just 2% of the unidentified bones can be attributed to this size class.

### *Unit Nad-A*

(approx. 200,000 BP) NISP = 11
The two levels of this most recent Acheulean unit yielded very few animal bones. In all, only 44 faunal remains were retrieved from these levels, both of which were excavated on a surface of nearly 20 m². The bones are heavily weathered and splintered. Obviously most of the faunal remains of this unit were already lost before they became buried for good. Among the 11 bones determined, Equids dominate, followed by gazelle and antelope. Only one bone was attributed to a Camelid, as is also the case for the tortoise and birds

Even if it is still difficult to estimate the impact of taphonomic biases and human selection on the variations of taxonomic abundances, faunal assemblages nevertheless testify to a more or less temperate steppe environment during the Middle Pleistocene.

## Active or passive acquisition

The mode by which animals were acquired either by scavenging (confrontational or not) or through active hunting during the Lower Palaeolithic is still debated (e.g. Dominguez-Rodrigo 2002). Archaeozoological studies usually use taxonomic abundance, frequency of skeletal elements and mortality patterns to estimate the way prehistoric people procured meat. Quantitative analyses are still in the early stages for Nadaouiyeh. However, preliminary results reveal several interesting observations in this debate.

A diverse range of animal body sizes is present in the archaeological levels of Nadaouiyeh. Exploited mammals vary in size from gazelle to Camelids and aurochs. Small game comprises tortoise and perhaps small birds. The presence of the slow-moving reptile indicates collection as a way to procure animal proteins (Speth & Tchernov 2002; Blasco 2008).

### *Gazelle*

The skeletal-element frequency and mortality pattern of the gazelle indicate that the small ungulate was actively hunted. Relative abundance of the anatomical elements, calculated for units having furnished more than 100 remains, indicates that complete animals were brought to the site (fig. 4). The meat-bearing elements are in general well represented.

A preliminary mortality pattern has been calculated for Nad-D. Work on ageing gazelle remains essentially concerns the mountain gazelle (*Gazella gazella*) (Davis 1980, 1983; Munro *et al.* 2009). In the present study, Davis' methods of age determination have been applied to the Pleistocene goitred gazelle (*Gazella subguttorosa*) from Nadaouiyeh. Even if the presented results have to be taken with caution, they still are indicative. Of the 30 mandibles studied, 20% belong to individuals aged less than 16–20 months (i.e. juveniles) and 80% to adults of more than 16–20 months. Observations on epiphysis (n=95), show 70% of bones reaching 18 months and more (i.e., adulthood). Although there is bias through differential conservation, prime adults are certainly present. According to M.C. Stiner (1990, 2002), only humans kill essentially prime adult prey, while carnivores hunt principally young and very mature prey, i.e., the weakest ones. Moreover, the large MNI of 23 gazelles for level c.8a (unit Nad-D, excavated surface of just 13.75 m²) strongly suggests that these animals were actively hunted and not scavenged.

Their presence possibly indicates seasonal hunting. During the Holocene the goitred gazelle passed through the El Kowm area in the course of their seasonal migrations in herds of 50 to 100 individuals, as shown by historical evidence, such as stone enclosures (desert kites), and archaeozoological studies of Holocene settlements in neighbouring areas (e.g. Tell Abu Hureyra, near Lake Assad) (Harrison & Bates 1991; Legge & Rowley-Conwey 1987). It is conceivable that Acheulean hunters directed their efforts towards this kind of animal congregation during their migrations.

### *Antelope, Equids and Camelids*

Mortality patterns for these three families are not yet available as the respective data are too restricted. For an estimation of the representation of anatomical parts, only inventories with at least 100 fragments were respected. For antelope, Equids and Camelids respectively, only one archaeological unit produced a sufficient number of identified bones per family (fig. 8).

Because of the extreme fragmentation of Equid and Camelid teeth, which are recognisable even as small fragments, the cephalic skeleton is overestimated. In contrast the extensive, mainly secondary, fragmentation of limb bones, limits a clear taxonomic attribution. As all anatomical parts are present in the samples, it is possible that the animals were brought to the site as a whole. Carcass parts of high nutritive value (mandibles, shoulder blade and limb bones) as well as those of low value (axial skeleton and foot) are well represented. For the antelope, limb bones bearing a lot of meat are well represented. Vertebrae, scapulae and pelvis, particularly for Equids and Camelids, represent a smaller percentage than the head (overestimated) and limb bones (underestimated), reflecting a possible differential transport.

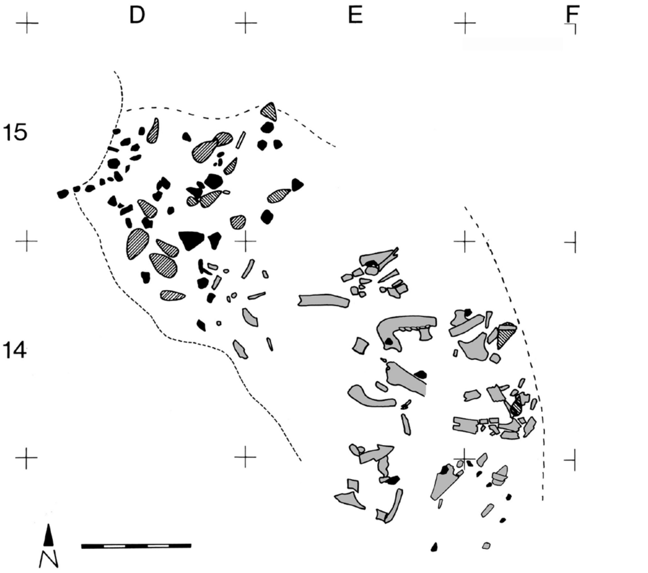


*Figure 7* - Planigraphic view of level c.5b, interpreted as a butchery zone. black: flint artefacts, hatched: hand axes, grey: bones (map R. Jagher).

| Units | head | axial skeleton | scapular & pelvic girdles | limb bones | feet | n |
|---|---|---|---|---|---|---|
| **Antelope** | | | | | | |
| **D a** | 11% | 6% | 8% | 27% | 47% | **148** |
| **Camelids** | | | | | | |
| **B 2** | 45% | 12% | 0% | 1% | 42% | **130** |
| **Equids** | | | | | | |
| **B 2** | 93% | 1% | 1% | 3% | 2% | **163** |

*Figure 8* - Skeletal parts frequencies of the antelope (Nad-Da), the Equids and the Camelids (Nad-B2).

All these medium- and big-sized ungulates are present with all body parts, suggesting they were brought as a whole to the camp site (fig. 8). Very likely they were dismembered for better transportation. This indicates that humans had primary access to complete and fresh carcasses. However, it is too early for further reflections at this stage.

### *Rhinoceros and aurochs*

Both taxa are represented by a small number of remains. Potentially some of the very fragmented limb bones, not attributed specifically, could also belong to these two big mammals. Mainly fragments of head (n=14) and elements of foot (n=20), followed by limb bones (n=5), axial skeleton (n=4) and scapular/pelvic girdles (n=1), testified to the presence of the aurochs, mainly in units Nad-D & C. This anatomical pattern, based as it is on a restricted database, is ambivalent. If the aurochs was actually hunted, this would imply that the spring was the kill-site, or the hunting place was not too far away, for the transportation of this massive animal is a challenge. Even dismembered quarters would be difficult to haul over a long distance. Another possible scenario could be that aurochs were scavenged, also at or near the spring.

The remains of rhinoceros comprise a nearly complete humerus (in fact the largest bone discovered in Nadaouiyeh), a fragment of a second one, fragments of a coxal and a mandible of a very young individual (milk teeth in eruption), discovered in Nad-D. Five more or less complete molars of adult rhinoceros, found in a geological context, document a wider distribution of this family in the site. Hunting this impressive herbivore with Palaeolithic technology was undoubtedly dangerous (e.g. Guérin & Faure 1983). European Middle Palaeolithic open-air sites, where active acquisition of rhinoceros is demonstrated, are characterised by a particular topography – a marshy depression and/or at the foot of a precipitous mounds – and by the presence of a large amount of bones belonging to young and very mature individuals (Auguste *et al.* 1998). At Nadaouiyeh, the marshy depression possibly played a role in the acquisition of the very young rhinoceros, trapped in the mire and then slaughtered.

Nevertheless, the exploitation of very big mammals was occasional and unsystematic, as is shown by the weak numbers of remains and individuals. In sub-unit Nad-C2, however, the aurochs accounts for 5% of the NISP and is even better represented than Camelids and Equids.

For the time being, the discrimination between hunting or scavenging or natural causes remains difficult. Animal proteins were provided by smaller herbivores, as shown by a much more important number of bones and individuals. Hunting strategy was probably a kind of ambush predation. Maybe the depression itself played a role, offering some vegetation for ambushing. The presence of water would certainly be attractive for animals. Nevertheless the skills displayed in the acquisition of meat were considerable throughout the Acheulean, as every hunted species required a specific strategy, with the assistance of several individuals, as a single hunter would barely be successful.

## Comparisons

### *El Kowm*

The El Kowm area is a real laboratory for studying the subsistence strategies of early hominids from the lower Pleistocene to the Holocene. The importance of this region is not only its extremely long history, which is exceptionally well documented, but also the fact that it all happened in the same landscape, within a territory less than 20 km across. Aïn al Fil, the oldest site so far known, dating back to more than one million years (J.-M. Le Tensorer pers. com.) is characterised by a rich and well preserved fauna with archaic elements; but no data are yet available as preliminary investigations of that site only started in 2008.

The fauna of the Oldowan levels from Hummal seems to be dominated by large animals. Two-thirds of identified species are Camelids, followed by cattle and Equids both in about the same proportion (Frosdick 2010). In contrast to Nadaouiyeh, the Hummal fauna throughout the stratigraphy seems to be dominated by large animals. Small animals, like the gazelle at Nadaouiyeh, are conspicuously rare. Without further investigation about the taphonomic processes in Hummal, a more detailed interpretation of this observation is difficult.


***Figure 9*** - Close up of level c.8b (Nad-D) showing the heavy *in situ* fragmentation of bones. 1 distal articulation of gazelle's metapodium, 2 mandibular teeth of gazelle in connection, 3 & 4 unindentified fragments.

For the Acheulean period, besides Nadaouiyeh, there is only scant palaeontological information from Al Meirah, tentatively dated to around 800,000 ka (Boëda *et al.* 2004). Only 17 bone fragments were retrieved, among them remains of hippopotamus. The presence of this large herbivore does not imperatively indicate the presence of important waterbodies, but certainly the existence of lush grazing indicating a much wetter climate than today.

From the Yabrudian and Hummalian periods, only data from Hummal are available to some extent. Again taphonomy blurs the picture, but probably there was a strong preference for big game like Camelids (Frosdick 2010). Equids are represented to a much lesser extent as are gazelles.

Concerning the Middle Palaeolithic, data are available from Hummal and to a much larger extent from Umm El Tlel. The Hummal assemblage again is dominated by large animals. Camelids are by far the most common family, among them a very massive form much larger than the common variant. Human behaviour is much better observed in the Umm el Tlel material, where active hunting is documented by a nice proof, with a Levallois point embedded in a vertebra of wild ass (*Equus africanus*) (Boëda *et al.* 1999). Animal exploitation varies heavily between the different levels, always focusing on one preferred species such as Camelids, Equids or gazelle, followed by one or at most two accessory prey adding up to about 90% of the faunal material of the respective levels (Boëda *et al.* 1998, 2001).

### *Near East*

Stringent palaeontological data and evidence of human activity for the Acheulean period in the Levant are rare due to the poor preservation of bones and small samples, impeding a clear picture of subsistence practices (e.g. Latamne (van Liere 1966), Um Qatafa (Vaufrey 1951), Azraq (Clutton-Brook 1970; Turnbull 1989). Hunting and butchering activities are demonstrated for the lower Pleistocene site of Ubeidiya, dated to about 1.6–1.2 ma, where Cervids and Equids were actively hunted and where cut marks and the absence of marrow-processing seem to indicate that the earliest Levantine hominids exploited these animals for meat only (Gaudzinski 2004). In a later period, at Gesher Benot Ya'aqov (around 800,000–750,000 BP), there is evidence for selective hunting and methodological butchering practices on fallow deer and for hunting even on elephant (Goren-Inbar *et al.* 1994; Rabinovich *et al.*, 2008). Other Levantine "Acheulean" sites clearly post-date Nadaouiyeh and occupy different ecological surroundings than the steppe of the Levantine interior. Unsurprisingly, subsistence strategies there show different approaches in a more progressive way (e.g. Qesem Cave (Stiner *et al.* 2009), Hayonim (Stiner 2005) and Misliya Cave (Yeshurun *et al.* 2007).

## Conclusion

At Nadaouiyeh, rhinoceros and aurochs were possibly scavenged, as active hunting is difficult to demonstrate. In any case, scavenging must not be considered an easy strategy for procuring meat. On the contrary, it requires an excellent knowledge of animal behaviour. Furthermore, as scavenging is occasionally practised by modern humans (for instance, among present day hunter-gatherers of Eastern Africa), evidence for this practice has no chronological and cultural value.

Archaeozoological studies of Lower Palaeolithic sites, as cited above, prove the ability of large game hunting among pre-Neanderthal people. *Homo erectus* was already an efficient hunter, able to prey on a diverse range of animals of different size. The preliminary studies of the Nadaouiyeh faunal remains also sustain such conclusions. All the ecologically expected local mammals were regularly exploited, attesting a perfect knowledge of each animal's behaviour and of the terrain. *Homo erectus* was able to adapt killing strategies to each species. To be successful, as they were, they had to coordinate and cooperate. This involves an efficient communication between group members. The cognitive development of *Homo erectus* is also visible in their lithic industry. At Nadaouiyeh, innovations occurred in a very short period of time (Jagher 2011) and the perfection of the hand axes discovered in the oldest occupation levels clearly exceeds pure functionality (Le Tensorer 2001).

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