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APPENDICES

Appendix A
The Middle Palaeolithic vertebrate fauna of Ifri n'Ammar

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1 Introduction

The Middle Palaeolithic section of the Ifri n'Ammar site includes levels 27 to 63, while the upper levels (1–26) date from the Iberomaurusian. A general description of and details on the excavation and stratigraphy are provided by Mikdad *et al.* (2000, 2002, 2004), Eiwanger (2003, 2004), Moser (2003) and Moser / Nami (this volume).

The fauna of the Iberomaurusian levels was briefly described by Hutterer / Mouhsine (in Mikdad *et al.*, 2000), and in more detail by Mouhsine (2003) and Eiwanger / Hutterer (2004). It was dominated by large African mammals, such as Zebra (*Equus* sp.), Hartebeest (*Alcelaphus buselaphus*), Gazelle (*Gazella cuvieri*), and Barbary Sheep (*Ammotragus lervia*), but also by Palaearctic species like Aurochs (*Bos primigenius*) and Red fox (*Vulpes vulpes*). As typical for the Iberomaurusian (Lubell 2004), these levels contained also large quantities of edible land snails. Palaearctic elements are not represented in the Middle Palaeolithic levels, and gastropod shells are not abundant. Bones are scarce, more fragmented and often embedded in matrix. However, new faunal elements indicate that this time period was very different from the Upper Palaeolithic. Here I present a summary of the (still ongoing) faunal analysis and discuss some interesting findings.

2 Methods

Faunal remains (bones, teeth, shells) from 63 archaeological levels (Enlévements 1–63) were identified and analysed during 7 campaigns from 1997 to 2009. Most levels yielded bones of amphibians, reptiles, birds and mammals, and shells of molluscs. The latter are not considered here but will be treated in detail in a forthcoming report. Sections from which faunal remains were studied are as follows: excavation 1997 (Enl. 1–27), 1999 (Enl. 16–37), 2001 (Enl. 1–7), 2002 (Enl. 21–33), 2003 (Enl. 34–63), 2004 (Enl. 48–63), and 2009 (Enl. 1–20).

Most of the sorting and identification work was done in field camps during the excavation period, or in the INSAP/Rabat. Problematic fragments (microfauna) were studied in detail at Zoologisches Forschungsmuseum Alexander Koenig, Bonn, using the comparative collections of vertebrate skeletons. The works of van den Driesch (1976), Walker (1985), Hillson (1986), and Peters *et al.* (1997) were very helpful for the identification of bones in the field. All archaeological material is stored at the Institut National des Sciences de l'Archéologie et du Patrimoine (INSAP), Rabat, Morocco.

3 Results

A preliminary list of the vertebrates identified (Table 1) from the Palaeolithic levels enumerates 28 species, most of them mammals. As the study of bird remains and of other microfaunal fragments has not been completed yet, the

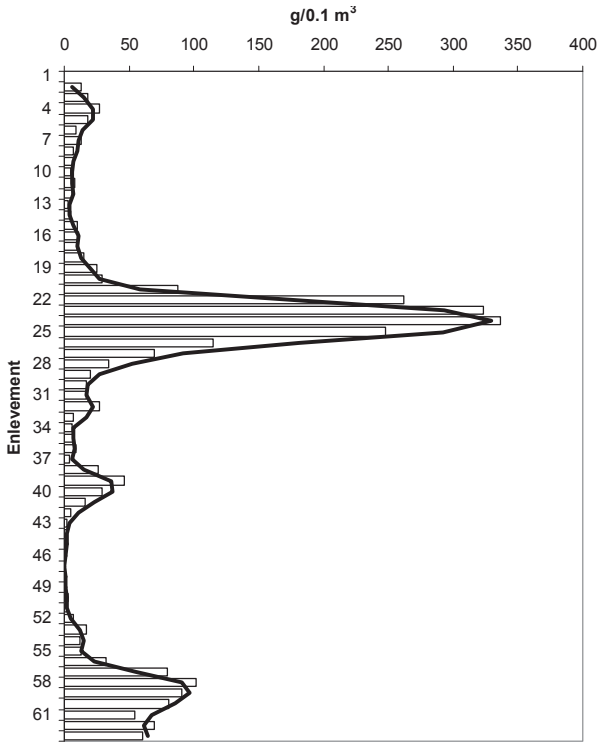

Fig. 1. Frequency of Ostrich egg shells (expressed as g/0.1 m³) in levels 1 to 63 of the Ammar section.

full list of vertebrate species may eventually reach 30 to 40.

The frequency of the faunal remains varies considerably throughout the archaeological sequence. Bones of large mammals are more frequent in the Iberomaurusian levels, but some species (*Ammotragus, Gazella, Equus*) occur throughout the sequence. Also land and freshwater turtles (*Testudo, Mauremys*) are found in almost all levels. The same is true for Ostrich (*Struthio camelus*), which is represented by egg shells and a few bones. The frequency of Ostrich egg shells (expressed by weight in a given volume of 100 × 100 × 10 cm, equal to one square-level) is shown in Figure 1. There is considerable variation in the frequency of egg shells, which seems to follow a regular pattern, either caused by human behaviour or by environmental changes.

Some other species require special comments:

– **Brown bear (*Ursus arctos*).** A single mandibular fragment with tooth was found at the upper limit of the Middle Palaeolothic section (IA2002, H15/27a). This is another example of the autochthoneous Pleistocene bear of Northern Africa (Ennouchi, 1957; Hamdine *et al*., 1998).

– **White rhinoceros (*Ceratotherium simum*).** Fragmented bones and teeth found in levels ENL 45–57, and in ENL 28 (Fig. 2). The species went extinct in North Africa in historical times (Lang, 1923). South of the Sahara, the species lives in grassland and savannah habitats (Groves, 1972). The White rhinoceros is a pure grass eater and likes water and mudholes. Geraads (2005) has shown that *Ceratotherium mauritanicum* is a Pliocene species, and therefore this name is not available for the extinct population of *C. simum*.

– **Roan antelope (*Hippotragus sp.*).** This large antelope is documented by isolated molars from levels 38a and 49. The species is an African faunal element, and prefers woodland and grassland savannah, dotted with few trees.

– **Zebra (*Equus sp.*).** Bones and bone fragments of horses or zebras are very abundant in the Iberomaurusian levels, but less so in the Middle Palaeolithique. Mouhsine (2003) studied the Ammar equines in some detail and suggested that they represent a large and a smaller form of zebras. The Middle Palaeolithic levels provided evidence only for the larger form, which is similar to Grevy's zebra (*Equus grevyi*), a species which has survived only in Ethiopia and Kenya, and which is adapted to living in arid landscapes. It is worth noting that Camps (1974) and also Gautier (1993), in their lists of Pleistocene-Holocene mammals of North Africa, included only *Equus mauritanicus* as a "zebra". However, this extinct taxon is considerably smaller and not represented in our material from Ammar.

– **Gundi (*Ctenodactylus gundi*).** Numerous remains of Gundis (Fig. 3) were found in levels 30 to 46. These are large rodents (290 g) that occur in arid and rocky country with a mean annual precipitation between 50 and 300 mm (Seguignes, 1983), and a mean annual humidity around 30 % (George, 1974). They hide in fissures between large rocks which provide shade and shelter. They feed on all kinds of herbs, grasses, and flowers and leaves of bushes such as *Launaea* or *Rosmarinus*.

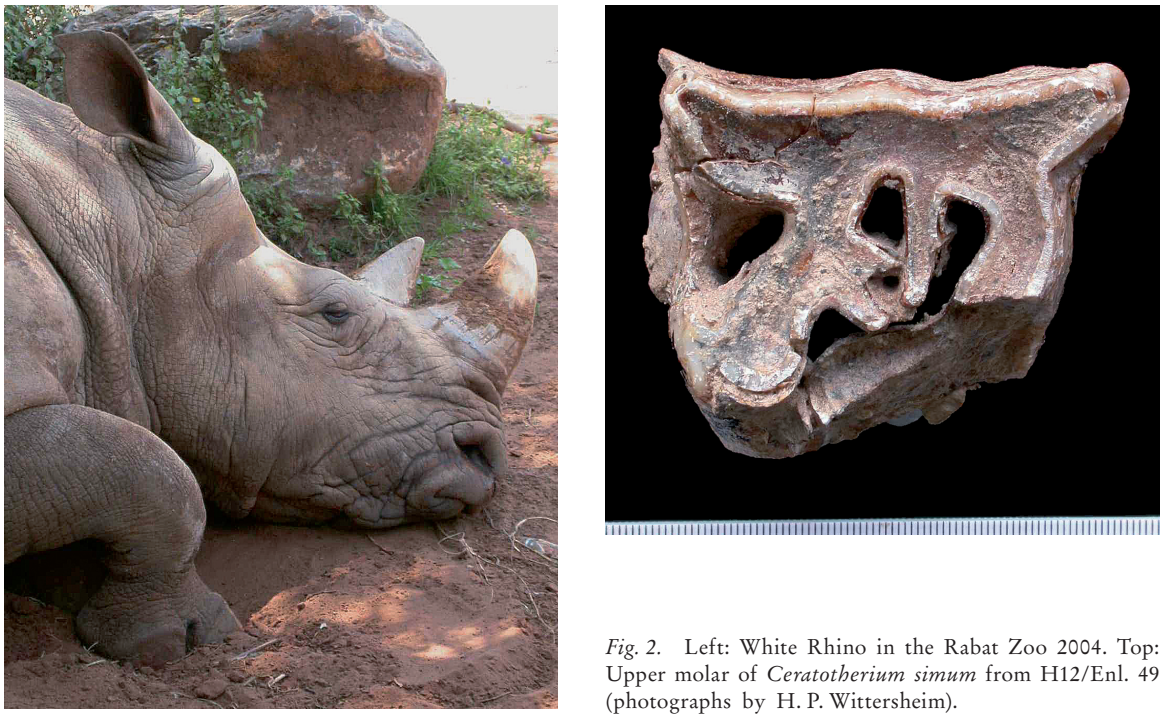

Fig. 2. Left: White Rhino in the Rabat Zoo 2004. Top: Upper molar of *Ceratotherium simum* from H12/Enl. 49 (photographs by H. P. Wittersheim).

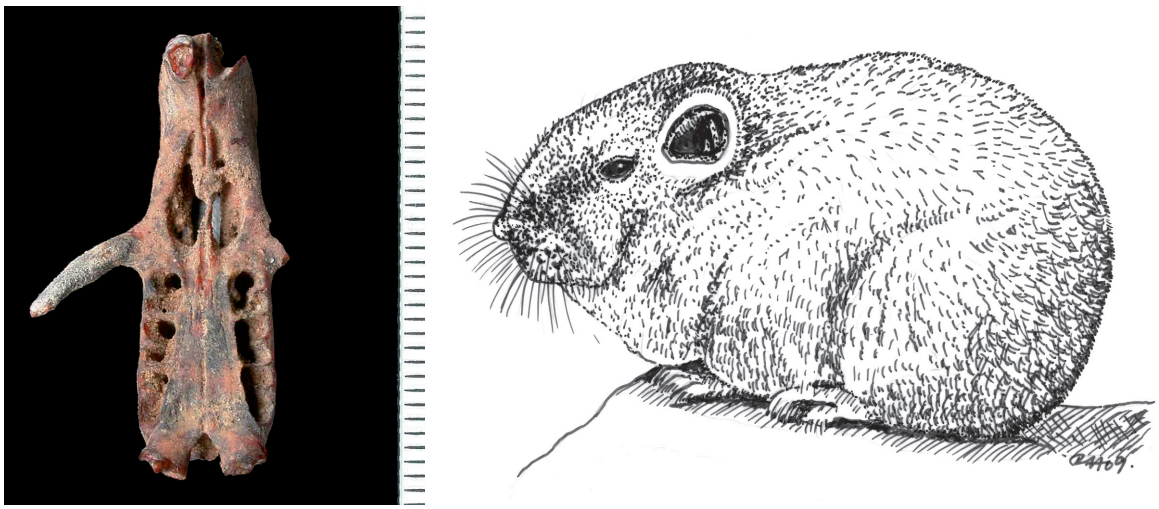

Fig. 3. Left: Maxillary fragment of Gundi, *Ctenodactylus gundi* (H12/Enl. 44). Right: Habitus of a living Gundi (sketch by RH based on a photograph).

4 Discussion

The former presence of Zebra, White rhino and Roan antelope indicates a savannah-like habitat for at least some time of the Middle Palaeolithic, with a permanent supply of mid-tall to tall grass (e. g. *Pennisetum* sp., *Pannicum* sp.). The Zebra (*Equus* aff. *grevyi*), which occurred almost over the entire length of the Palaeolithic profile, was probably adapted to arid conditions (as its modern counterpart in Kenya and Ethiopia) and could thus survive in the environs of the cave.

A surprising result is the complete absence of Hartebeest (*Alcelaphus buselaphus*) in the Middle Palaeolithic levels. The species was moderately common between the upper levels 2 and 26 (Mikdad *et al.*, 2000). According to

Mammalia: Soricomorpha
Shrew, *Crocidura* sp.

Mammalia: Erinaceomorpha
Hedgehog, *Atelerix algirus* (Lereboullet, 1842)

Mammalia: Chiroptera
Bat, *Rhinolophus* sp.

Mammalia: Carnivora
Wild cat, *Felis* sp.
Leopard, *Panthera pardus* (Linnaeus, 1758)
Striped weasel, *Poecilictis libyca* (Hemprich & Ehrenberg, 1833)
Brown bear, *Ursus arctos* (Linnaeus, 1758)

Mammalia: Perissodactyla
White rhino, *Ceratotherium simum* (Burchell, 1817)
Zebra, *Equus* aff. *grevyi* (Oustalet, 1882)

Mammalia: Artiodactyla
Barbary sheep, *Ammotragus lervia* (Pallas, 1777)
Roan antelope, *Hippotragus* sp.
Cuvier's gazelle, *Gazella cuvieri* (Ogilby, 1841)
Small Gazelle, *Gazella* sp.

Mammalia: Rodentia
Barbary ground squirrel, *Atlantoxerus getulus* (Linnaeus, 1758)
Gundi, *Ctenodactylus gundi* (Rothmann, 1776)
Porcupine, Hystrix sp.
Jird, *Meriones grandis* (Cabrera, 1907)
Gerbil, *Gerbillus* sp.

Mammalia: Lagomorpha
Hare, *Lepus* sp.

Mammalia: Afrosoricida
Elephant shrew, *Elephantulus rozeti* (Duvernoy, 1833)

Aves: Struthioniformes
Ostrich, *Struthio camelus* (Linnaeus, 1758)

Aves: Accipitriformes
Monk vulture, *Aegypius monachus* (Linnaeus, 1766)

Aves: Passeriformes
Starling, *Sturnus unicolor* (Temminck, 1820)

Aves: Apodiformes
Pallid swift, *Apus pallidus* (Shelley, 1870)

Reptilia: Testudines
Freshwater turtle, *Mauremys leprosa* (Temminck & Schlegel, 1835)
Terrestrial turtle, *Testudo graeca* (Linnaeus, 1758)

Reptilia: Squamata
Lizard, *Lacertidae* spec.

Amphibia: Anura
Toad, *Bufo* sp.

Tab. 1. List of vertebrates documented from levels 27 to 63.

Panouse (1957), the Hartebeest was living in the mountains and hills of Morocco until its extinction in 1925. Our data seem to indicate that this species did not occur in the region around the Ifri n'Ammar before the Iberomaurusian.

4.1 Rhinos and a possible hunting strategy

Bones and teeth of White rhino (*Ceratotherium simum*) were found only in level 28 and in levels 45–57. A temporal coincidence with large stone tools, particularly with peduncular points (figured by Mikdad *et al*., 2003) suggest that such points may have been used as weapons for the hunting of large mammals, including rhino. As White rhinos are very strong animals, the hunting of them with spears armored with a peduncular point would certainly be a risky endeavour. Reports from Central Africa (Lang, 1925) tell that people hunted rhinos with spears at night, while the animals were resting or sleeping: ". . . Azande hunters, justly famed among the tribes for dangerous exploits, are admired as much for killing a rhinoceros with a spear as an elephant or buffalo, which are acknowledged dangerous game. Anyone can understand that the spear, thrown only at close quarters, will not instantly dispatch but only infuriate such huge monsters, no matter how tame they are otherwise. These rhinoceroses are of course attacked when sleeping". The same dangerous method may have been used by the Middle Palaeolithic people.

In the Ammar sequence, peduncular points were found in the levels 27–30 (rhino 28), and in levels 50–52 (rhino 45–57), with a gap of 19 levels without penduncular points. This time gap is characterized by the presence of desert rodents.

4.2 Desert rodents and climate

Gundis (*Ctenodactylus gundi*) appear in the archaeological record between levels 30 and 46. This sharply terminated distribution can only be explained by a climatic shift towards higher aridity. A decrease in rainfall would have caused a decline of the savannah vegetation and a subsequent shift of large herbivores to more favourable regions, or their local extinction. In consequence, the Middle Palaeolithic people may have moved into more suitable areas, at least seasonally.

The northernmost occurrence of living gundis in Morocco is Guercif (34°13'N, 03°21'W) (Aulagnier / Thévenot, 1986), some 80 km south of Ammar along the Moulouya River. The climate is semi-arid. Another locality with an extant Gundi population is Bouarfa (32°32'N, 01°57'W), 230 km south of Oudja. In July 2009, temperatures in Bouarfa ranged between 29° and 46° C, and precipitation was 0. This may provide an idea about the climatic conditions under which Gundis thrive (see also Seguignes, 1983). The climatic map of North Africa (Jackson, 1961) shows that the region around Guercif is the northernmost point of an arid zone with a mean annual precipitation below 200 mm. This climatic zone covers most of the known records of *Ctenodactylus gundi* from Morocco (Aulagnier / Thévenot, 1986) and adjacent Algeria (Kowalski / Rzebik-Kowalska, 1991). By accepting this rather close relationship we can assume that the climatic zone with a mean annual precipitation below 200 mm moved north for about 80–100 km towards the Ammar site in the Middle Palaeolithic, e. g. in the section where Gundis were present at that time (levels 30–46). Thermoluminescence dating (Richter, this volume) of heated flint from levels 40–42 resulted in an age estimation of 130 ± 8 ka, and dating of the more upper levels 28–30 yielded an age of 83 ± 6 ka. An arid period, as indicated by the presence of Gundi, would have occurred roughly between 130 and 100 ka. Our hypothesis is supported by palaeotemperatures of the water surface of the Northern Atlantic (Sancetta *et al*., 1973; Meco *et al*., 2006), which show a sudden increase in water surface temperatures between 130 and 110 ka.

Abstract

The vertebrate fauna of the Middle Palaeolothic levels of Ifri n'Ammar included a minimum of 28 species of mammals, birds, and reptiles. Barbary sheep (*Ammotragus lervia*), Cuvier's gazelle (*Gazella cuvieri*), and Zebra (*Equus* aff. *grevyi*) occur throughout the sequence, as do land and freshwater turtles (*Testudo, Mauremys*). Egg shells of Ostrich (*Struthio camelus*) are very abundant but their frequency varies considerably along the sequence. Remains of White rhino (*Ceratotherium simum*) were found only in level 28 and in levels 45–57. A temporal coincidence with large stone tools, particularly with peduncular points, suggests that such points may have been used as weapons for the hunting of large mammals, including rhino.

Gundis (*Ctenodactylus gundi*) appear in the archaeological record between levels 30 and 46, indicating a climatic shift towards higher aridity between 130 and 100 ka.

Resumé

La faune des vertébrés des niveaux du Paléolithique moyen d'Ifri n'Ammar comprend un minimum de 28 espèces de mammifères, des oiseaux et des reptiles. Le mouflon (*Ammotragus lervia*), la gazelle de Cuvier (*Gazella cuvieri*), et le zèbre (*Equus* aff. *grevyi*) existent le long de la séquence ainsi que la tortue terrestre et d'eau douce (*Testudo*, *Mauremys*). Les tests d'œuf d'autruche sont très abondants mais leur fréquence varie considérablement le long de la séquence. Les restes du rhinocéros blanc (*Ceratotherium simum*) ont été trouvés uniquement dans les niveaux 28 et 45–57. Leur contemporanéité avec l'abondance des outils lithique, notamment des pointes pédonculées suggère que ces dernières auraient été utilisées comme arme pour la chasse de grands mammifères dont le rhinocéros. Le goundi (*Ctenodactylus gundi*) apparaît au sein du mobilier archéologique entre les niveaux 30 et 46, indiquant un changement climatique tendant vers une grande aridité entre 130 et 100 ka.

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