

THE MAMMALIAN REMAINS OF THE MESOLITHIC AND EARLIER STRATA IN ABRI DU PAPE

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INTRODUCTION

L'Abri du Pape (AP for short) is one of the several caves and rock shelters in the Roches de Freyr that have yielded evidence of use by Mesolithic and Middle Neolithic people. The site, discovered and first tested by Ph. Lacroix in 1988, is located at the base of a 100 m high steep limestone cliff on the right bank of the Meuse Valley, almost directly opposite the Château de Freyr, 5 km upstream of Dinant and 7 km downstream of the French border at Givet. The rock shelter faces southwest and can become very warm in the afternoon in summer and even unpleasantly humid, as the author found out during a visit to the site. The main covered area of the shelter now measures 8 m wide by 5 m deep and is filled with at least 6.5 m of sediment, consisting mainly of small to medium angular clasts or *éboulis secs*, together with larger blocks, sandy silt and, in the cultural horizons, charcoal, bones, and other organic matter, as well as stone artifacts.

The Mesolithic sequence comprises layers 20 to 22 and subdivision lenses (20.1, 21.1, 22.1) pertaining to each. Layer 20 is situated about 4.5 m above the present day normal, artificially maintained level of the Meuse, which flows right at the foot of the talus in front of the site. The entire Mesolithic sequence totals maximum ca. 70 cm. Calibrated accelerator dates on charcoal for the top of stratum 20, the base of stratum 21, the middle stratum 22 and the top of stratum 22.1 are respectively: 6757-6509, 7968-7703, 7949-7645 and 7938-7602 BC. Thus the upper stratum 20 would document a late Mesolithic occupation during late Boreal/initial Atlantic times, while the lower strata testify to a millennium older occupation, in the late Preboreal/early Boreal. Some 14 m² were excavated, which seem to represent the majority of the livable surface occupied by Mesolithic people. Such a restricted area, as well as the absence of any man-made features such as dug out or stone-lined hearths and the rather poor artifactual assemblages, suggests that the shelter may have been an ephemeral, albeit repeatedly used campsite.

Below the Mesolithic occurrences, a few artifacts were found in the nearly sterile clay and *éboulis* of strata 23 to 25; these may be of terminal Magdalenian age, but are not very diagnostic. Stratum 26 is a culturally sterile gravel; bedrock was reached only at the rear of the rockshelter below the clay of stratum 23. Above the Mesolithic strata, a ca. 3.5 m thick series of Neolithic, Iron Age, Roman and Medieval deposits have been excavated. The Neolithic is represented by Michelsberg artifacts with human burials; higher up (strata 11 to 16), S.O.M. people appear to have used the site. Some human remains in stratum 20 consisting mainly of ribs and phalanges, have not been incorporated in Table 1, summarizing the fauna of the excavations. These finds no doubt derive from an intrusive Neolithic grave.

Table 1 : Distribution of faunal remains in the Mesolithic archeological sequence of Abri du Pape(a).

		20	20.1	21	21.1	22	22.1	23	24	24.1	25	26
Molluscs	landsnails/small freshwater mollusks(b)	R	-	R	-	R	R	R	R	-	R	-
	larger freshwater bivalve	R	-	R	-	-	-	-	-	-	-	-
Fish	(Pisces spp.)(c)	164	-	61	-	59	2	7	1	1	-	-
Amphibians	mainly common toad (<i>Bufo bufo</i>)	88	6	122	-	72	9	46	2	-	-	-
Reptiles	lizard (<i>Lacerta</i> sp.)	-	-	-	-	+	-	1	+	+	+	-
	small snake (<i>Coronella/Vipera</i> sp.)	-	-	-	-	+	-	+	+	+	-	-
	larger snake (<i>Natrix natrix</i>)	-	-	+	-	-	-	-	-	+	-	-
Birds	(Aves spp.)(d)	48	10	56	-	89	7	16	15	5	10	2
Insectivores	pygmy shrew (<i>Sorex minutus</i>)	-	-	-	-	+	-	-	-	+	-	-
	common shrew (<i>S. araneus/coronatus</i>)	1	2	2	-	4	1	1	1	1	3	-
	water shrew (<i>Neomys</i> sp.)	-	1	-	-	-	-	-	-	-	-	-
	white toothed shrew (<i>Crocidura russula</i>)	-	-	3	-	2	2	-	-	-	-	-
	mole (<i>Talpa europaea</i>)	6	5	2	-	13	6	5	1	+	+	-
	hedgehog (<i>Erinaceus europaeus</i>)	9	-	-	-	2	-	-	-	-	-	-
Chiropters	Beichstein's bat (<i>Myotis beichsteinii</i>)?	-	-	1	-	-	-	-	-	-	-	-
	common pipistrelle (<i>Pipistrellus pipistrellus</i>)	-	-	-	-	+	-	+	-	-	+	-
	serotine (<i>Eptesicus serotinus</i>)	-	-	-	-	3	1	1	2	+	1	-
	common long-eared bat (<i>Plecotus auritus</i>)	-	-	+	-	+	-	-	-	-	-	-
	unidentified postcranial remains	-	-	+	-	+	+	+	+	-	-	-
	hare (<i>Lepus capensis</i>)	-	-	-	-	-	-	-	-	-	1	-
Lagomorphs	rabbit (<i>Oryctolagus cuniculus</i>)	1	-	-	-	-	-	-	-	-	-	-
	bank vole (<i>Clethrionomys glareolus</i>)	13	1	25	-	30	6	4	1	+	-	+
Rodents	common/short-tailed vole(e)	-	-	1	-	9	6	1	1	1	4	+
	water vole (<i>Arvicola terrestris</i>)	-	-	1	-	+	2	+	3	3	9	-
	voles (<i>Microtidae</i> spp.)(f)	1	1	5	-	12	6	3	2	2	2	+
	yellow-necked mouse (<i>Apodemus flavicollis</i>)	63	17	81	-	148	41	13	1	2	-	-
	edible dormouse (<i>Glis glis</i>)	-	-	-	-	+	-	-	-	-	-	-
	common hamster (<i>Cricetus cricetus</i>)	-	-	-	-	1	-	-	-	-	1	3
	red squirrel (<i>Sciurus vulgaris</i>)	-	-	-	-	4	-	-	-	-	-	-
Carnivores	wolf (<i>Canis lupus</i>)	2	-	-	-	1(g)	-	-	-	-	-	-
	fox (<i>Vulpes vulpes</i>)	7	-	-	-	7	-	-	-	-	-	-
	wild cat (<i>Felis silvestris</i>)	13	-	7	-	28	-	-	-	-	-	-
	weasel (<i>M. nivalis</i>)	-	-	-	-	1	-	1	-	-	-	-
	stoat (<i>M. erminea</i>)	-	-	-	-	-	-	-	-	-	-	1
	polecat (<i>M. putorius</i>)	3	-	1	-	-	-	-	-	-	-	-
	marten (<i>Martes martes</i>)	-	-	1	-	3	-	-	-	-	-	-
	otter (<i>Lutra lutra</i>)	9	-	-	-	-	-	-	-	-	-	-
	wild boar (<i>Sus scrofa</i>)	25	-	2	-	10	1	1	-	-	2	-
Artiodactyls	roe deer (<i>Capreolus capreolus</i>)	14	-	3	1	1	-	1	-	-	-	-
	red deer (<i>Cervus elaphus</i>)	18	-	7	-	5	-	2	3	-	-	-
	wild cattle (<i>Bos primigenius</i>)	5	-	-	-	2	-	-	-	-	-	-
Total identified vertebrate remains		490	43	381	1	506	90	103	33	15	33	6
Total unidentified microvertebrate remains(h)		1300	25	435	-	640	110	61	18	10	11	9
Total unidentified larger mammal remains(i)		1450	225	1400	3	1500	350	450	225	225	450	-
Total vertebrate remains(i)		3240	293	2216	4	2646	550	614	276	250	494	15

(a) Specimen counts; in the case of the reptiles, shrews, mole, chiropters, voles and mice based on jaw remains, except if stated otherwise. R: rare; + : presence established on postcranial remains or on remains from the microvertebrate column M20a (Table 2); (b) see LOPEZ BAYON & LACROIX (this volume); (c) see VAN NEER (this volume); (d) see DEVILLE & GAUTIER (this volume); (e) *Microtus arvalis/agrestis*; (f) mainly the three groups identified; (g) perhaps dog; (h) residue mainly of amphibian, reptile, micromammal remains; estimated number; (i) estimated numbers.

For more details on the geographical setting, stratigraphy and cultural sequence, the reader is referred to the other contributions in this volume. What follows focuses on the mammal remains from the Mesolithic sequence down to stratum 26. These were obtained by hand-picking during the excavation and by water-screening through 1 mm mesh. Some preliminary notes on the faunal spectrum which includes non-marine molluscs, fish, birds, amphibians, reptiles, micromammals and macromammals was already published (Straus *et al.* 1993a, 1993b, 1994, 1997, in press). The molluscs, fish and birds are dealt with in this same volume respectively by López Bayón and Lacroix, Van Neer, and Deville and Gautier. The analysis was carried out in the Ghent laboratory very much like previous analyses on Belgian cave sites by the author (see for example Gautier 1995).

In addition to the fauna obtained during the archeological excavation (Table 1), sediment columns were sampled by Ph. Lacroix for malacofauna and microvertebrates, especially rodents. The sequence of subsquare M20a, encompassing stratum 21 to stratum 26 has been incorporated in this study (Table 2). Finds in this column, included in the inventories of Table 1, have been recorded in the latter as mere presences with the plus symbol, to complete the general faunal sequence and to illustrate its continuity. It should be born in mind that the microvertebrate column does not include strata 20 and 20.1; hence the record in these layers as presented in Table 1 is probably less complete than that in the lower levels.

The AP fauna is a welcome addition to the archeozoological record of the Mesolithic in Belgium. Sites of this prehistoric period do not often yield well preserved faunal remains and Andersen and collaborators (1990) cite only two sites with significant faunal remains from Belgian territory: Roche-aux-Faucons (Cordy 1976) and Grotte du Coléoptère (Cordy 1975; Cordy 1973; Mourer-Chauviré 1983). The nearest Mesolithic site with fauna from adjacent countries is in Luxembourg: Loschbour (Cordy 1982). The diacalse of Mielmont (Binon *et al.* 1979) is an example of a site where Mesolithic faunal elements cannot be separated clearly from those of earlier or later periods. An example of an open air site with a very much impoverished fauna is Weelde-Paardsdrank (Van Neer in Huyghe and Vermeersch (1982); Oudenaarde-Donk, an important site in the Scheldt Valley also produced only a few remains (Van Der Plaetsen *et al.* 1995). However, two recently excavated open air sites in Wallonia yielded rather good faunal assemblages: Place St. Lambert in Liège (López Bayón 1994) and Place St. Hilaire in Namur (Van Neer in Mees and Plumier 1994; Van Neer 1995).

IDENTIFICATION AND SYSTEMATICS

The osseous remains consist mainly of fragments rarely exceeding a few centimeters in maximum length. An appreciable number (up to 50% and more in some assemblages) of the finds exhibit greyish to white discoloration as a result of their exposure to fire; the other remains are generally pale yellow in color. The identification rates (the ratio number of identified remains/total number of remains) in the Mesolithic sequence are quite high (15 to 19%), because of the many microvertebrate remains which were identified and as a result of the effort made to identify the larger mammal remains most likely due to the activities of people. In the lower strata (23-24) the identification rates show a distinct drop (6 to 12%),

probably because of the intrusion of small, mainly unidentified fragments of larger mammals from above in the assemblages which are otherwise dominated by microvertebrates. That the large mammals are intrusive here is indicated by the presence of burned bone despite the scarcity or absence of other indicators of cultural activity in these layers.

The malacofauna studied by López Bayón and Lacroix (this volume) comprises mainly land snails, some semi-aquatic and aquatic gastropods, as well as some bivalves of small size. Table 1 refers separately to the presence of some very fragmentary remains of larger freshwater bivalves. They could derive from *Margaritana*, *Unio* or *Anadonta* (see Adam 1960), of which specimens were perhaps brought to the shelter by people.

For the identification of the herpetofauna, Böhme (1977), Glastra (1980) and guides to the extant distributions of these vertebrates (De Witte 1948; Arnold *et al.* 1978) were helpful. Most of the amphibian remains pertain to large anurans. Random samples of *ilia* were tested for diagnostic characters and match the description of the ilium of the common toad *Bufo bufo*, which is the largest *Bufo* species of Europe. The fact that the common toad is widely distributed in Western Europe, in very diverse biotopes, corroborates the identification.

Lizards were identified on their very typical teeth bearing dentals and some other cranial elements; vertebrae were also found in some of the samples containing cranial remains. *Lacerta agilis* and *L. vivipara* are the two lizards found in Belgium and both are widely distributed in Europe, indicating that they are adapted to quite diverse microhabitats. According to Glastra (*ibid.*) no morphological differences of the dentals permit separation of the *Lacerta* spp. normally found in the Low Countries, but most likely the AP material represents the more ubiquitous *L. vivipara*.

Snakes are represented by some dentals and vertebrae. Most of these remains pertain to small snakes, of which two species occur today in Belgium: *Coronella austriaca* and *Vipera berus*. Both are widely distributed in Europe, indicating that they are not narrowly adapted. I know of no clear diagnostic criteria to separate the AP remains (see Glastra, *ibid.*) and therefore they are listed as *Coronella/Vipera* sp. Some larger vertebrae derive from snakes the size of *Natrix natrix*, the only larger snake found in Belgium today.

The identification of the micromammals is based on cranial remains, mainly lower jaws, making use of the present-day distributions of the taxa involved (Lange *et al.* 1986; see also Frechkop 1958; van den Brink 1972). To begin with the insectivores, these are represented by hedgehog (*Erinaceus europaeus*), mole (*Talpa europaea*) and several shrews. The identified hedgehog remains pertain mainly to the postcranial skeleton. The identification of the other insectivores relies on mandible finds. Lange and collaborators (*ibid.*) accept that the larger *Sorex* of Western Europe have to be divided into two species: *S. araneus* and *S. coronatus*. The distinction between both taxa requires detailed biometric research and the use of discriminant functions. As far as the general morphological characters of the often incomplete material permit, the AP *Sorex* would belong mainly to *S. araneus*. The only mandible of water shrew is too incomplete for specific identification, but it may represent Miller's water shrew (*Neomys anomalis*), which appears to be distributed mainly at higher altitudes in the southern

half of Western Europe; today it is found in the nearby French Ardennes. As to the *Crocidura* mandibles, the most complete ones seem to represent *C. russula*, because of their size.

The recognized bat remains include some jaws, mainly lower ones, and a few long bones. The mandibles have been grouped and identified mainly on the basis of the teeth formulas and the alveolar C-M3 lengths with reference to the extant bat species found in Belgium. Most frequent would be the serotine; this may be due to its large size and therefore better chances to be preserved and sampled.

Most microvertebrate remains derive from smaller rodents. Among the latter, loose teeth and mandibles are dominant. The mandibles and some upper jaw remains separate easily into the radicate bunodont group pertaining to *Apodemus* and a second very hypsodont group referable to the microtids. The *Apodemus*-mandibles were tested for size and seem to be assignable mostly if not exclusively to the larger *A. flavicollis*. An appreciable part of the microtids could be easily divided further as done, on the basis of size and teeth characters. The edible dormouse (*Glis glis*) is represented by some of its characteristic jugal teeth. The presence of hamster, *C. cricetus*, was established on cranial and postcranial remains, but squirrel (*Sciurus vulgaris*) yielded postcranial remains only.

The identification of the macromammals represented almost exclusively by small, rather fragmentary miscellaneous remains, did not pose particular problems, since the species encountered pertain to the Holocene game fauna of Western Europe. The osteology of these animals is very well documented, but a few remarks concerning the rabbit, some carnivore remains, wild boar, and the large bovid follow. One metapodial represents the rabbit in stratum 20; the identification is based on the small size of the specimen. Its preservation state indicates a recent intrusive origin, a fact which helps to corroborate the identification: the rabbit did not reach Belgium until the first or second millennium of our era (Van Damme and Ervynck 1988).

The larger canid remains of stratum 20 consist of two incomplete, but clearly very large metapodials. A burned proximal, separate epiphysis of a phalanx represents a canid lower in the sequence, in stratum 22. Primitive dogs, such as those of the Mesolithic, do not reach the size of wolves, so the metapodials clearly represent their wild ancestor, *Canis lupus*. The very fragmentary find in stratum 22 compares in size with adult phalanges of large dogs. It might represent a not yet fully grown wolf or a dog.

A few fragmentary cranial fragments and two incomplete humeri represent marten. On the basis of the large size of the lower carnassials found in stratum 22, as well as some of the other remains and paleosynecological considerations, the remains can be tentatively attributed to the pine marten, *Martes martes*. This marten is often larger than the beach marten, *M. foina*, and prefers wooded biotopes (Lange *et al.* 1986).

The wild boar remains do not present identification problems, but mention should be made of a pathological modification. In stratum 22, a distal cubitus occurs, which shows evidence of a healed, but not reduced fracture. The large size of the fragment suggests it derives from a male. Did it get hurt fighting during the rutting season?

As to the large bovid remains, they could represent bison (*Bison bonasus*) or wild cattle (*Bos primigenius*). The few remains show no diagnostic characters except for a carpal (*os carpi ulnare*) in stratum 20, which exhibits clearly the morphology of *Bos* (Stampfli 1963: 139, fig. 19). The preliminary notes on the AP fauna (Straus *et al.* 1993b) suggested that the bovid remains and the human remains in stratum 20 might be intrusives caused by the Neolithic burials dug from the overlying post-Mesolithic layers; in that case the bovid finds could represent large domestic cattle. However, large bovid finds occur also in stratum 22. This and the fact that wild cattle is a typical Mesolithic game species, suggests that all the *Bos* remains are almost certainly contemporaneous with the other Mesolithic finds.

TAPHONOMY

The quantities of remains differ markedly in the various strata. These differences relate to the excavated volumes, especially in the case of the microvertebrates, and to the production of bone offal by people in the case of the larger mammals. As usual, the remains divide into several taphonomic groups (Gautier 1987), of which the most diverse and numerous, is that of the penecontemporaneous intrusives, including the smaller molluscs, the herpetofauna, the insectivores, the chiropters and the rodents. These animals arrived at the shelter through their own means or were carried there as prey by other animals visiting or living in AP. This also applies to most if not all of the bird remains (Deville and Gautier, this volume). As already stated, the rabbit is beyond doubt a recent intrusive.

Since traces of larger carnivores such as wolf are very limited, the remains of the artiodactyls can be safely considered to have been the prey of the Mesolithic hunters. Wild boar, roe deer, red deer and wild cattle have indeed been sampled regularly in Mesolithic sites where no doubt exists about the accumulators involved. The carnivores however present a problem. All of them may have paid visits to the shelter or even lived there. The one exception is the otter, which digs its burrows near the water and prefers the aquatic realm. Since the carnivore remains are clearly associated with the hunted artiodactyl remains in the Mesolithic sequence, many of them represent probably hunted animals. Exceptions may be the small mustelids, weasel and stoat, which also occur in the pre-Mesolithic sequence; they may belong to the penecontemporaneous intrusive smaller mammal fauna.

The above-mentioned presence of burned bones in the pre-Mesolithic strata 23 and 24 indicates clearly that small Mesolithic remains had moved downward as a result of bioturbation or other processes such as percolation among *éboulis secs*. For this reason I include the few identified larger mammals remains of the lower sequence in the early Mesolithic. Comparable intrusive movements of microvertebrates may have somewhat influenced the micromammalian spectra of the lower sequence, without however affecting them to the point that they become inexplicable in ecological terms (see further).

For clarity's sake, Table 3 repeats the composition of the faunal assemblages which we can reasonably assume to represent remains of animals bagged by Mesolithic hunters.

Table 2 : Microvertebrates from sediment column M20A in Abri du Pape(a).

		freshwater fish(b)	amphibians(c)	lizard (<i>Lacerta</i> sp.)	small snake(s)(d)	large snake(e)	small birds(b)	<i>Sorex araneus coronatus</i>	<i>Sorex minutus</i>	<i>Crocodyrus russula</i>	<i>Talpa europaea</i>	<i>Pipistrellus pipistrellus</i>	<i>Eptesicus serotinus</i>	<i>Plecotus auritus</i>	not identified chiropters	<i>Chetronomys glareolus</i>	<i>Microtus arvalis/agrestis</i>	<i>Arvicola terrestris</i>	Microtidae(f)	<i>Apodemus flavicollis</i>	<i>Glis glis</i>	<i>Criceus cricetus</i>	<i>Mustela nivalis</i>	<i>Mustela erminea</i>
stratum 21, spit 4	-	R	-	-	+	1+0	1	-	1	+	-	-	-	-	+	3	-	-	1	7	-	-	-	-
stratum 22, spit 6	-	1	-	-	-	-	1	-	-	+	-	-	-	-	-	+	-	-	3	7	-	-	-	-
spit 7	1	R	-	2	-	1+R	1	-	-	-	-	-	-	-	-	1	1	+	4	10	-	-	-	-
spit 8	-	R	2	1	-	6+R	5	1	1	2	1	2	1	+	2	2	-	5	25	-	-	-	-	-
spit 9	-	?	-	-	-	1+0	1	-	-	2	-	1	-	-	-	3	1	-	5	12	+	-	-	-
spit 10	4	1	-	1	-	9+0	6	5	3	+	-	4	1	-	3	-	-	5	19	1(g)	-	1	-	-
spit 11	1	?	-	-	-	1+1	1	-	-	+	-	-	-	+	+	2	+	1	11	+	-	-	-	-
stratum 23, spit 12	-	-	1	-	-	2+R	4	-	1	+	-	-	-	-	-	2	-	-	+	5	-	-	-	-
spit, 13	-	-	1	+	-	5+R	-	-	-	+	1	-	1	+	3	-	1	1	2	-	-	-	-	-
stratum 24, spit 14	-	-	-	-	-	1+R	-	-	-	+	-	-	-	-	-	1	-	-	1	-	-	-	-	-
spit 15	-	-	1	-	-	1+R	1	-	-	+	-	-	-	-	-	+	-	1	+	-	-	-	-	-
spit 16	-	-	1	+	-	1+R	-	-	-	+	-	-	-	-	-	1	-	2	2	1	-	-	-	-
spit 17	-	-	1	+	-	1+F	-	-	-	-	-	1	-	-	+	-	1	3	3	-	-	-	-	-
spit 18	-	-	3	-	-	1+FF	1	-	-	-	-	-	-	-	-	1	-	+	+	1	-	-	-	-
stratum 24.1, spit 19	-	-	1	-	-	0+F	-	-	-	-	-	1	-	-	-	-	-	+	1	+	-	-	-	-
spit 20	1	-	5	+	-	2+FF	2	2	-	-	-	-	-	-	-	1	1	1	4	2	-	-	-	-
stratum 25, spit 21	-	-	2	-	-	1+FF	2	-	-	1	-	-	-	-	-	-	-	+	3	-	-	+	-	-
spit 23	-	-	-	-	+	2+F	-	-	-	-	1	-	-	-	-	-	-	1	1	-	-	-	-	-
spit 24	-	1	-	-	-	0+1	-	-	1	1	-	-	-	-	-	-	-	+	1	-	-	-	-	-
spit 25	-	-	-	-	-	0+R	-	-	-	1	-	-	-	-	-	-	-	1	+	-	-	-	-	-
stratum 26, spit 26	-	-	-	-	-	0+R	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-
spit 27	-	-	-	-	-	3+R	-	-	-	-	-	-	-	-	-	-	-	1	+	-	-	+	-	1
spit 28	-	-	-	-	-	0+R	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
spit 29	-	-	-	-	-	1+R	-	-	-	+	-	-	-	-	+	1	1	-	3	-	-	-	-	-

- (a) specimen counts, based on jaw remains, except if stated otherwise. R : rare; F(F) : (very) frequent; + presence revealed by other remains than jaws.
 (b) cranial or postcranial remains which have been added to the assemblages studied by Van Neer (this volume) or Deville and Gautier (this volume); second entry for birds concerns egg shell fragments; (c) postcranial remains, mainly *Bufo bufo*; (d) *Coronella/Vipera* sp., see text;
 (e) *Natrix natrix*, see text; (f) smaller species, not including *Arvicola terrestris*; (g) four teeth presumably from one mandible.

Table 3: The supposed game bag of the AP Mesolithic hunters (specimen counts).

stratum	20	21	21.1	22	22.1	23/26(a)	21/26(b)	totals
wolf	2	-	-	1(c)	-	-	1	4
fox	7	-	-	7	-	-	7	14
wild cat	13	7	-	28	-	-	28	48
polecat	3	1	-	-	-	-	-	4
marten	-	1	-	3	-	-	3	4
otter	9	-	-	-	-	-	-	9
wild boar	25	2	-	10	1	3	16	41
roe deer	14	3	1	1	-	1	6	20
red deer	18	7	-	5	-	5	17	35
aurochs	5	-	-	2	-	-	2	7

(a) faunal elements assumed to be derived from the early Mesolithic; (b) total early Mesolithic assemblage including finds from 23/26; (c) perhaps dog, see text.

PALEOECOLOGY

Information on the ecological requirements of the various mammals encountered was derived from general faunal guidebooks such as Frechkop (1958), van den Brink (1972), Lange *et al.* (1986). As a whole, the artiodactyls clearly indicate wooded conditions, with presumably mixed forests, in which most of the carnivores have no difficulty finding a niche, especially the secretive wild cat. The low frequency of wild cattle no doubt reflects its preference for open parkland. The water-dwelling otter and the wild pig, with its predilection for regular mudbaths, emphasize the nearness of the river Meuse. If we take a closer look, we perceive a quantitative shift from the lower to the upper assemblage (strata 21/26 versus stratum 20). Red deer becomes much less frequent and the smaller game species, wild boar and especially roe deer, increase in relative frequency (1:0.46 to 1:0.77). The foregoing may reflect a change from more open woodland to denser wooded conditions with less undergrowth, affecting particularly the mobility and feeding of red deer. Aurochs is poorly represented in both assemblages, suggesting that already in the early Mesolithic, open biotopes were restricted near the river Meuse, but if we include it in our calculations, the shift is still there (1:0.58 to 1:0.86).

As to the microvertebrates (Tables 1 and 2), some clear indicators of wooded to very wooded conditions are notable by their frequency or mere presence. These are the bank vole, yellow-necked mouse, edible dormouse and squirrel, especially in the Mesolithic sequence. The water shrew and water vole live preferentially near water, so would often the pipistrelle bat. Table 4 illustrates shifts in the composition of the small rodent assemblages, based on grouping

the microtids versus the yellow-necked mouse. The microtid group consists predominantly of voles preferring open biotopes: the common and short-tailed voles (*Microtus arvalis/agrestis*) and the above mentioned water vole. As to the bank vole, this rodent inhabits bush and woodland, preferably deciduous forests, but appears to be less exacting in this respect than the yellow-necked mouse. Since the bank vole is generally well represented, most of the not-specifically identified smaller microtid remains probably belong to this species. The ratio microtids/*Apodemus* therefore illustrates probably a shift from more open woodland to dense forest conditions comparable to the one the larger mammals would illustrate. On the basis of the frequencies of land snails, a comparable trend towards more wooded conditions characterizes the molluscan assemblages (López Bayón and Lacroix, this volume). In fact, the small rodent assemblages can be grouped on the basis of the given ratio as follows: late Mesolithic (20/20.1); earlier Mesolithic (21/22), and two pre-Mesolithic ones (23 and 24/26). Exactly how these relate to the bio- and/or chronozonations of the Holocene (for recently proposed divisions, see Verbruggen *et al.* 1996) is difficult to establish. Few or no Holocene microvertebrate sequences are known which are precisely dated and free of taphonomic bias due to bioturbation.

Table 4: Microtids versus *Apodemus* in the AP sequence based on counts of maxillar and mandibular fragments.

stratum	excavation		square M2a		totals	
20	15/63	1:4.2	-	-	14/63	1:4.5
20.1	2/17	1:8.5	-	-	2/17	1:8.5
21	32/81	1:2.5	4/7	1:1.8	36/88	1:2.4
22	51/148	1:2.9	38/84	1:2.2	89/232	1:2.6
22.1	20/41	1:2.1	-	-	20/41	1:2.1
23	8/13	1:1.6	7/7	1:1	15/20	1:1.3
24	7/1	1:0.2	13/5	1:0.4	20/6	1:0.3
24.1	6/2	1:0.3	8/2	1:0.3	14/4	1:0.3
25	15/-	1:0	7/-	1:0	22/-	1:0
26	-/-	-	7/-	1:0	7/-	1:0

The AP fauna can be compared with the one excavated in the Mesolithic layer 5a of the Grotte du Coléoptère (Dewez *et al.* 1983; Cordy 1975, 1983). This layer has been attributed to the Atlantic period on the basis of one C14-date and the small rodent spectrum. However, it is an open-work clastic deposit affected by intrusions from the overlying deposits. It is now attributed to the Middle Mesolithic, which is supposed to pre-date the Atlantic and the C14-date on a bulk sample of bone splinters has been rejected (Gob 1990; Crombé 1996; Vermeersch 1996). An AMS-date on a human tooth from the lower Ahrensburg level 6b also suggests percolation from the overlying Neolithic layer 4 (Charles 1993). The faunal assemblage comprises mainly wild boar, followed by horse, red deer and wild cattle; the smaller fur-bearing animals include beaver, fox, badger and marten. Domestic animals are represented by dog and quite a few remains are assigned to domestic goat; some not very diagnostic *Bos* remains may represent domestic cattle. The presence of badger, a well known bioturbator, and rabbit, decidedly a latecomer in the Belgian fauna, emphasize the presence of late burrowing intrusives. Reworking of older small faunal elements may also have occurred

(Cordy 1983: p.32-33). The marked dominance of wild boar with respect to red deer (68:7) suggests forest conditions with much better living conditions for the first animal than at AP, but strangely enough roe deer is missing. As to the micromammals, they include insectivores, chiropters, stoat, but mainly rodents, among which bank vole and *Apodemus* predominate. The ratio of microtids/*Apodemus* is 44:32 or 1:0.7 and falls within the range of those in the lower AP-sequence. However, the quantification of the small rodents is based on counts of molars. Most probably, the low-crowned radicate molars of *Apodemus* have a lesser chance to be preserved or sampled than the very high-crowned and larger microtid molars. Nevertheless, I consider it to be impossible that the Mesolithic of the Grotte du Coléoptère would correlate with the upper AP-sequence. I find it more likely that it dates to the Boreal; as far as I understand, Cordy (1975) originally suggested either a Boreal or an Atlantic age for the Mesolithic of the Grotte du Coléoptère. The foregoing discussion does not take into account the influences of reworking, intrusions and the differences in the site catchment of AP and the Grotte du Coléoptère. The latter is located in a small valley leading to the Aisne, a tributary of the Ourthe River. All in all, the Mesolithic of the Grotte du Coléoptère does not provide a good basis for comparison.

The few notes published on the Mesolithic macrofauna of the Grotte Walou near Trooz are confusing (Simonet 1993a and 1993b in Dewez *et al.* 1993; Turmes 1996). In both Mesolithic layers (A5 and A4), domestic cattle and sheep would be present; wild mammals in the upper layer (A4) seem to include only hare, wild cat, beech marten (*Martes foina*) and badger (*Meles meles*). The Holocene microvertebrate sequence of the Grotte Walou has however been analyzed in detail (Turmes, *ibid.*). Unfortunately, the author does not seriously consider the presence of domestic animals in the Mesolithic records, or the traces of bioturbation reported in the upper Mesolithic layer (A4) and the overlying Neolithic (A2). The upper Mesolithic layer is attributed to the Atlantic period and the lower one (A5) to the Preboreal on palynological grounds (Heim in Dewez *et al.*, *ibid.*). In this lower layer and the one below it (A6), also attributed to the Preboreal, cold-loving micromammals, such as pika (*Ochotona pursilla*), narrow-skulled vole (*Microtus gregalis*) and lemmings (*Dicrostonyx torquatus*, *Lemmus lemmus*), still survive. These rodents have not been identified in the lower AP sequence. This could be taken as an indication that these strata post-date the Preboreal, but the samples are restricted; ill-defined remains of narrow skulled vole may also have been erroneously attributed to *Microtus arvalis/agrestis*. The malacological analysis (López Bayón and Lacroix, this volume) dates the lower AP sequence to the Tardiglacial (strata 25 and 26) and the Preboreal (stratum 24). Given the small rodent sample size, I cannot disagree with this diagnosis for the basal levels (26-24) on the basis of the microfauna.

The recently excavated site of the Place St-Lambert in Liège offers a better, if incomplete, opportunity for archeozoological comparisons. According to the available C14-dates, the site would pertain to about the same period as the late Mesolithic in AP. The palynological spectra suggest an open environment at the junction of the alluvial plain of the Meuse and the steep flank of the Hesbaye plateau, covered with bushes and some trees (Gustin *et al.* 1994; Heim 1994). The game fauna (López Bayón 1994) includes the same artiodactyls as are found at AP, plus horse and beaver. Dog is attested by a rib, which is not a very diagnostic element, and by gnawing traces. One small livestock find, probably sheep, is most probably a Neolithic intrusive, as are some pig remains. The low number of wild boar and roe

deer remains with respect to red deer (48:70) corroborates the hypothesis adopted for AP, according to which the former animals thrive better in woodland than the latter. The relatively high frequency of wild cattle with respect to the first group (14:48) and the presence of horse also testify to more open conditions at Liège than during the penecontemporaneous late Mesolithic of AP.

The comparison with the Mesolithic occurrence of the Place St.-Hilaire in Namur has to remain tentative, as the available data are still incomplete (Mees and Plumier 1994; Van Neer 1995). The pollen analysis suggests a Boreal forest, with beech, pine and hazel for the deposits in which the Mesolithic finds occur (Munaut in Mees and Plumier, *ibid.*). The game animals include various fur-bearers, the trio of wild boar, roe deer, red deer, plus some aurochs. For the finds combined into one assemblage, the ratio of wild boar/roe deer:red deer (101:67) lies between the ratios computed for AP.

EXPLOITATION OF THE CATCHMENT

The wild boar remains in AP represent animals of quite variable age. A deciduous upper third incisor and a fragmentary radius from stratum 20, a femur of stratum 22 and a lower deciduous canine in stratum 25 are derived from very young animals. Comparison with data on dental and postcranial development (Mohr 1960; Wagenknecht 1972; Prummel 1987) suggest animals just born or only a few weeks old. As wild boar have their young normally between March to May (Mohr, *ibid.*), these finds would indicate occupation of AP in spring or early summer. However, other remains suggest the presence of older young boars. Among these, a fragmentary skull (stratum 20) includes the second molars which were apparently still hidden in the maxilla and the barely worn first molars; this skull derives hence from an individual of at least three months, but less than nine months (Mohr, *ibid.*); it suggests occupation later in the year, in late summer or fall. Other remains represent adults, among which two fragmentary large canines (stratum 20 and 22) are no doubt derived from rather old males. Female wild boars live in groups with their offspring; most adult males form other groups, but dominant males are solitary. In fall, the latter compete with the other males for access to the females. The presence of baby boars and large canines indicates clearly that the Mesolithic hunters preyed not only on nursery groups, but also hunted male groups or solitary males. Nursery groups probably are easier prey, because of the juveniles and even perhaps because of the protective and more predictable behavior of the mothers. Single males also may be less dangerous than male groups and the large canines might derive from such loners.

Most of the other plant-eating game remains represent almost fully and fully grown animals; these remains do not permit any conclusions, even tentative, concerning hunting strategies or scheduling. However, if we accept that most of the fur-bearing mammals are to be included in the game bag, one can argue that they were mainly killed or trapped in fall or winter because their pelts are then in optimal condition. As to the fish fauna, it is clearly of anthropic origin. However it does not present evidence of systematic, seasonal exploitation, except for one find of allis shad (*Alosa alosa*), which suggests capture in late spring or early summer. The avifauna is mostly if not exclusively non-anthropic, but a few goose remains,

probably referable to the white fronted goose (*Anser albifrons*), might have been bagged by people in the cold season (Deville and Gautier, this volume). Summing up, it would seem that AP was occupied at different moments of the year, but the combined evidence suggests that spring and/or early summer and fall were the preferred periods. The small numbers of identified specimens may indicate furthermore that the visits were short and irregular. Since the shelter is situated near the Meuse, one can easily imagine that the hunters bagged their prey animals, when these came to the river. Wild boars especially love water and like to take prolonged mudbaths (Mohr 1960); perhaps they had some preferred wallows near AP. As the samples are very restricted and consist mainly of small fragments, no signs of differential transport of complete carcasses or particular body parts are detectable.

CONCLUSIONS AND SUMMARY

The lower AP sequence provides us with vertebrate assemblages of which the earliest, in strata 23 to 26, result from the non-anthropogenic accumulation of small-vertebrate remains and some mammalian remains intrusive from the overlying Mesolithic assemblages. The latter are assignable to the late Mesolithic (stratum 20) and earlier Mesolithic (strata 21, 21.1, 22, 22.1) and contain taphonomically comparable microvertebrate spectra, as well as a restricted number of remains brought to the site as a consequence of the hunting or trapping activities of people. The game includes mainly wild boar, roe deer, red deer and wild cattle, very probably several carnivores, fish and perhaps some larger birds. Shifts in the rodent spectra from bottom to top indicate a increasingly more wooded landscape. A comparable trend appears to be documented by the larger game animals bagged by people. On the basis of C14 dates, the Mesolithic occurrences have been assigned to the late Preboreal/early Boreal and to the late Boreal/early Atlantic period, respectively. The Mesolithic faunal assemblages are not in contradiction with these attributions, but comparative faunal sequences are lacking either in the vicinity of AP or in adjacent regions. As to the pre-Mesolithic strata, the absence of "cold" micromammals such as pika or lemming, may indicate they pertain to the Preboreal, but the samples are small and the malacological data suggests that the lower AP sequence comprises Tardiglacial and Preboreal deposits. Some of the wild boar finds indicate visits to the site in spring and/or early summer and in fall, while the fur-bearing carnivores were perhaps taken in fall or winter. The fishes do not present evidence for a recurrent, seasonal exploitation of the Meuse River, nor do the birds, since these are mostly if not exclusively natural deaths. The foregoing, and the restricted number of finds due to human activity, underscore that the shelter was used at different times of the year for short periods only.

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BIBLIOGRAPHY

ADAM W., 1960,

Faune de Belgique. Mollusques. Tome I. Mollusques Terrestres et Dulcicoles. Bruxelles: Inst. Roy. Sci. Nat. Belgique.

ANDERSEN S.H., BIETTI A., BONSALE C., BROADBENT N.D., CLARK G.A., GRAMSCH B., JACOBI R.M., LARSSON L., MORRISON A., NEWELL R.R., ROZOY J.-G., STRAUS L.G. and WOODMAN P.C., 1990,

Making Cultural Ecology Relevant to Mesolithic Research: I. A Data Base of 413 Mesolithic Fauna Assemblages. In *Contributions to the Mesolithic in Europe, Papers presented at the Fourth International Symposium "The Mesolithic in Europe" (Leuven, 1990)* (P.M. Vermeersch and Ph. Van Peer, eds), pp. 23-51. Leuven: Leuven Univ. Press.

ARNOLD E.N., BURTON J.A. and OVENDEN D.W., 1978,

Elseviers Reptielen- en Amfibieëngids. Amsterdam: Elsevier.

BINON J., CAHEN D. and GAUTIER A., 1979,

Fouille d'une diaclasme dans les rochers de Mielmont (Onoz), vallée de l'Orneau. *Bull. Soc. roy. Belge Etud. Géol. Archéol. Les Chercheurs de la Wallonie* 24, 1-10.

BÖHME G., 1977,

Zur Bestimmung quartärer Anuren Europas an Hand von Skettelementen. *Wissenschaftliche Zeitschrift der Humboldt-Universität zu Berlin, Math.-Nat. R.*, 26(3), 283-300.

CHARLES R., 1993,

Towards a new chronology for the Belgian Late glacial: recent radiocarbon dates from the Oxford AMS system. *Notae Praehistoricae* 12, 59-62.

- CORDY J.-M., 1975,
Bio- et chronostratigraphie des dépôts tardiglaciaires et holocènes de la grotte du Coléoptère, à Bomal-sur-Ourthe. *Ann. Soc. géol. Belg.* 98(2), 291-296.
- CORDY J.-M., 1976,
Etude des faunes attribuées au site mésolithique de la Roche-aux-Faucons (Province de Liège). *Bull. Soc. roy. belge. Anthropol. Préhist.* 87, 75-76.
- CORDY J.-M., 1982,
La faune mésolithique du gisement de Loschbour près de Reuland (G.D. de Luxembourg). In *Le Mésolithique entre Rhin et Meuse. Actes du Colloque sur le Paléolithique supérieur final et le Mésolithique dans le Grand-Duché de Luxembourg et dans les régions voisines (Ardenne, Eifel, Lorraine)* (Luxembourg, 18-19.05.1981) (A. Gob et F. Spier, eds), pp. 119-128.
- CORDY J.-M., 1983,
Les mammifères de la couche mésolithique de la grotte du Coléoptère à Bomal-sur-Ourthe (Province de Luxembourg). *Mém. Soc. Wallonne de Palethnologie* 5, 31-51.
- CROMBÉ Ph., 1996,
Epipaleolithicum en Vroeg- en Midden-Mesolithicum in zandig Vlaanderen. Bijdrage tot de studie van de typo-chronologie en de nederzettingsstructuur. (Ph.D. diss. Archeology, University Gent).
- DEVILLE J. and GAUTIER A., 1999,
Bird Remains from Abri du Pape. In *l'Abri du Pape*, edited by J.-M. Léotard, L.G. Straus and M. Otte. Liège, ERAUL 88, p.123-128.
- DEWEZ M., CORDY J.-M., GILOT E., KOZLOWSKI S., MOURER-CHAUVIRÉ C., TOUSSAINT G. and TOUSSAINT M., 1983,
La couche mésolithique de la Grotte du Coléoptère à Bomal-sur-Ourthe (Province du Luxembourg). *Mém. Soc. Wallonne de Palethnologie* 5.
- DEWEZ M., COLLCUTT S.N., CORDY J.-M., GILOT E., GROESSENS-VAN DYCK M.-CL., HEIM J., KOZLOWSKI S. and E., LACROIX D. and SIMONET P., 1993,
Recherches à la Grotte Walou à Trooz (Province de Liège, Belgique). Premier rapport de fouille. *Mém. Soc. Wallonne de Palethnologie* 7.
- DE WITTE F.G., 1948,
Faune de Belgique. Amphibiens et reptiles. Bruxelles: Patrimoine Mus. Royal d'Hist. Nat. Belgique.
- FRECHKOP S., 1958,
Faune de Belgique. Mammifères. Bruxelles: Patrimoine Inst. Roy. Sci. Nat. Belgique.

- GAUTIER A., 1987,
Taphonomic groups: How and Why? *ArchaeoZoologia* 1(2), 45-52.
- GAUTIER A., 1995,
The faunal remains of Trou Magrite (Namur Province, Belgium). In *Le Trou Magrite. Fouilles 1991-1992* (M. Otte et L.G. Straus, dirs.), pp. 137-158. Liège, ERAUL 69.
- GLASTRA R., 1980,
Osteologische determinatie van de inheemse herpetofauna. Handleiding bij de herpetologische vergelijkingscollectie van het I.P.P. Amsterdam: Albert Egges van Giffen Instituut voor Prae- en Protohistorie (I.P.P.).
- GOB A., 1990,
Chronologie du Mésolithique en Europe. Atlas des dates ¹⁴C. Liège: Centre Informatique de Philosophie et Lettres, Univ. Liège. (Histoire de l'Art et Archéologie 1).
- GUSTIN M., LÉOTARD J.-M. and OTTE M., 1994,
Le Mésolithique de Liège: campagne 1994. *Notae Praehistoricae* 14, 113-123.
- HEIM J., 1994,
Approche palynologique du paysage végétal à l'interface Mésolithique-Néolithique dans le site de la Place Saint-Lambert à Liège. *Notae Praehistoricae* 14, 147-151.
- LANGE R., van WINDEN A., TWISK P., de LAENDER J. and SPEER Ch., 1986,
Zoogdieren van de Benelux. Amsterdam: Erla.
- LÓPEZ BAYÓN I., 1994,
La faune Mésolithique de la Place St-Lambert à Liège. *Notae Praehistoricae* 14, 125-145.
- LÓPEZ BAYÓN I., LACROIX Ph. And LEOTARD J.-M., 1999,
Etude des restes malacologiques de l'Abri du Pape. In *l'Abri du Pape*, edited by J.-M. Léotard, L.G. Straus and M. Otte. Liège, ERAUL 88, p.69-80.
- MEES N., PLUMIER J., MUNAUT A.V., DEFGNÉE A. and VAN NEER W., 1994,
Premier état des recherches sur le Néolithique et le Mésolithique au Grognon, à Namur. *Notae Praehistoricae* 14, 109-112.
- MILLER G.S., 1912,
Catalogue of the Mammals of Western Europe (Europe exclusive of Russia). In the collection of the British Museum. London: Trustees British Museum.
- MOHR E. 1960,
Wilde Schweine. Wittenberg Lutherstadt: Ziemsen (Neue Brehmbücherei 247).

- MOURER-CHAUVIRÉ C., 1983,
Les oiseaux de la couche 5 de la grotte du Coléoptère à Bomal-sur-Ourthe (Belgique).
Mém. Soc. Wallonne de Palethnologie 5.
- OTTE M., STRAUS L.-G., LÉOTARD J.-M. and NOIRET P., 1994,
Recherches Paléolithiques et Mésolithiques en Belgique, 1993: Le Trou Magrite et l'Abri du Pape. In *Actes de la deuxième journée d'Archéologie namuroise* (M.H. Corbiau and J. Plumier, eds.), pp. 9-17. Namur: Service des Fouilles/Dépt. d'Hist. de l'Art et d'Archéol. and Fac. Univ. Notre Dame de la Paix.
- PRUMMEL W., 1987,
Atlas for identification of foetal skeletal elements of Cattle, Horse, Sheep and Pig. Part 2. *Archaeozoologia* 12, 11-42.
- STAMPFLI H.R., 1963,
Wisent, *Bison bonasus* (Linné) 1758, Ur, *Bos primigenius* Bojanus, 1827, und Hausrind, *Bos taurus* (Linné), 1758. In *Seeberg Burgäschisee-Süd, Teil 3. Die Tierreste* (J. Boessneck, J.-P. Jequier and H.R. Stampfli), pp. 117-196. *Acta Bernensia* 2.
- STRAUS L.G., OTTE M., CORDY J.-M., LEOTARD J.-M., NOIRET P., GAUTIER A., HAESAERTS P. and LACROIX Ph., 1993a,
Paleolithic and Mesolithic research in Belgium, 1993: Le Trou Magrite, Huccorgne and l'Abri du Pape. *Old World Archaeology Newsletter* 17(1), 17-24.
- STRAUS L.G., GAUTIER A., LACROIX Ph., LEOTARD J.-M., NEWMAN M. and OTTE M., 1993b,
The Pope's Mesolithic: preliminary report on 1993 excavations of the Lower Levels in l'Abri du Pape (Dinant, Namur province, Belgium). *Mesolithic Miscellany* 14(1/2) (1993), 2-5.
- STRAUS L.G., OTTE M., LACROIX Ph., LEOTARD J.-M., GAUTIER A., SUMMERS J., ORPHAL J. and PERNAUD J.-M., in press,
L'Abri du Pape: A Limited-Function Mesolithic Campsite along the Meuse at the Edge of the Belgian Ardennes. In *Epipaléolithique et Mésolithique en Europe, Paléoenvironnement, peuplements et systèmes culturels. Actes du 5^e colloque international UISPP (commission XII), Grenoble, 18-23 septembre 1995* (P. Bintz, ed.).
- STRAUS L.-G., OTTE M., GAUTIER A., HAESAERTS P., LÓPEZ BAYÓN I., LACROIX, Ph., MARTINEZ A., MILLER R., ORPHAL J. and STUTZ A., 1997,
Late Quaternary prehistoric investigations in southern Belgium. *Préhist. Européenne* 11, 145-184.
- TURMES M., 1996,
Etude des associations de microvertèbres des couches holocènes de la Grotte Walou. *Bull. Soc. roy. Belge Etud. Géol. Archéol. Les Chercheurs de la Wallonie* 36, 119-140.

- VAN DAMME D. and ERVYNCK A., 1988,
Medieval ferrets and rabbits in the castle of Laarne (East-Flanders, Belgium): a contribution to the history of a predator and its prey. *Helinium* 28(2), 278-284.
- VAN DEN BRINK F.H., 1972,
Zoogdierengids. Amsterdam: Elsevier.
- VAN DER PLAETSEN P., VANMOERKERKE J. and PARENT J.P., 1986,
Mesolithische en neolithische sites aan de "Donk" te Oudenaarde. *Archaeologia Belgica* II(1), 15-18.
- VAN NEER W., 1982,
Faunal analysis. In *Late Mesolithic Settlement at Weelde-Paardsdrank* (D. HUYGE and P.M. VERMEERSCH). In *Contributions to the Study of the Mesolithic in the Belgian Lowland* (P.M. Vermeersch, ed.), pp. 143-144. *Studia Prehistorica Belgica* 1. Tervuren: K.M.M.A./Contactgroep NFWO prehistorie).
- VAN NEER W., 1995,
La faune mésolithique provenant du site de l'ancienne Place Saint-Hilaire à Namur. In *Actes de la Troisième Journée d'Archéologie namuroise* (J. Plumier and M.-H. Corbiau, dir./ed.), pp. 49-57. Namur: Service des Fouilles/Dépt. d'Hist. de l'art et d'Archéol. and Fac. Univ. Notre Dame de la Paix.
- VAN NEER W., 1999,
Fish remains at Abri du Pape. In *l'Abri du Pape*, edited by J.-M. Léotard, L.G. Straus and M. Otte. Liège, ERAUL 88, p.129-139.
- VERBRUGGEN C., DENYS L. and KIDEN P., 1996,
Belgium. In *Palaeoecological Events During the Last 15 000 Years: Regional Syntheses of Palaeoecological Studies of Lakes and Mires in Europe* (B.E. Berglund, H.J.B. Birks, M. Ralska-Jasiewiczowa and H.E. Wright, eds), 16, pp. 553-574. New York: Wiley.
- VERMEERSCH P.M., 1996,
Mesolithic in the Benelux, South of the Rhine. In *7. The Mesolithic. Colloquium XIII: Formation of the European Mesolithic Complexes. XIII International Congress of Prehistoric and Protohistoric Sciences* (Forlì, Italia, 8/14 september 1996) (S.K. Kozłowski and C. Tozzi, eds), pp. 33-39. Forlì: A.B.A.C.O.
- WAGENKNECHT E., 1972,
Die Altersbestimmung des erlegten Wildes. Berlin: VEB Deutscher Landwirtschaftsverlag.