

Chapter 8

Monospecific or Species-Dominated Faunal Assemblages During the Middle Paleolithic in Europe

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ABSTRACT

Monospecific or species-dominated faunal assemblages are a common phenomenon especially during the Upper Pleistocene in Europe. Analysis of these assemblages indicated hunting by Neandertals and moreover point to a variety of exploitation tactics used which can be interpreted in terms of a highly flexible subsistence strategy. Though these assemblages provide an excellent source for our understanding of Neandertals' subsistence, the coarse chronological resolution during the Pleistocene prevents further and far-reaching conclusions concerning evolutionary behavioural trends during the Middle Paleolithic.

INTRODUCTION

The last decades have seen considerable debate about the ways in which Neandertals obtained their food. Much progress has been made in this domain. There is growing evidence that Late Middle Paleolithic hominids were capable hunters (Stiner 1994; Gaudzinski 1995; Shea 1998; Boëda *et al.* 1999; Speth and Tchernov 2001). Even more so than Middle Upper Paleolithic anatomically modern humans, it appears that Late Neandertals were top-level carnivores at

the dominating end of the food chain (Bocherens *et al.* 1999; Richards *et al.* 2000, 2001). However, the nature of their strategy of biomass exploitation remains debatable as detailed results of archaeozoological analysis seldom permit a consideration of this point.

Current research suggests that Neandertals were highly mobile, a feature seen in their raw material transfer patterns (Féblot-Augustins 1999; Roebroeks and Tuffreau 1999) as well as in the spatial structuring of their sites (Kolen 1999). High mobility might have enabled Neandertals to successfully deal with the sometimes highly unstable conditions of Pleistocene biotopes. Climatic shifts and the resulting variety of environmental responses could have led to continuous fluctuations in quality and quantity of ungulate biomass in any given area. Efficient hominid adaptation to these conditions would put a premium on high flexibility. A number of synthetic analyses of regional subsistence (Boyle 2000; Conard and Prindiville 2000; Patou-Mathis 2000) emphasize flexibility in subsistence tactics. Common to these analyses is the interpretation of high species diversity as reflecting flexibility.

The present paper will demonstrate that so-called monospecific Middle Paleolithic faunal assemblages can likewise be interpreted in terms of flexible subsistence strategies. It will suggest that the term "monospecific" possibly masks important variation in the activities that led to the accumulation of these faunal assemblages. This issue will be discussed in a broader context, with reference to the temporal chronology of these faunas.

MONOSPECIFIC FAUNAL ASSEMBLAGES

Sites with monospecific faunas are characterized by the high dominance of remains of a single species, represented by minimum numbers of individuals of up to over 100 animals, associated with lithic artifacts. These assemblages occur in numerous open-air sites (Farizy *et al.* 1994) but also in caves (Valensi 2000). From the early Weichselian onwards, monospecific or species-dominated faunal assemblages are found all over Europe (Figure 1). The list of species at these sites includes herd animals such as bovids (Gaudzinski 1996), equids (Pillard 1972; Ulrix-Closset 1975; Chase 1986), cervids (Pillard 1972; Valensi 2000), reindeer (Gaudzinski 1999; Moigne and Barsky 1999) and saiga (Formozov 1959) but also species with a solitary life style such as rhinoceros (Bratlund 2000).

Human exploitation of the fauna is shown by cut marks and hammerstone-induced impact notches on bones. Although monospecific faunal records could result from natural catastrophic events without any hominid interference, the regularity with which they occur in association with anthropogenic artifacts in open-air sites as well as in caves during the last Glacial is more suggestive of primary hominid interference, and analysis of some of these assemblages points to hominid hunting (Gaudzinski 1996).

Unfortunately this important source for our understanding of Middle Paleolithic subsistence suffers from the fact that taphonomic analyses have been undertaken only in a few cases. However, recently excavated faunal assemblages,

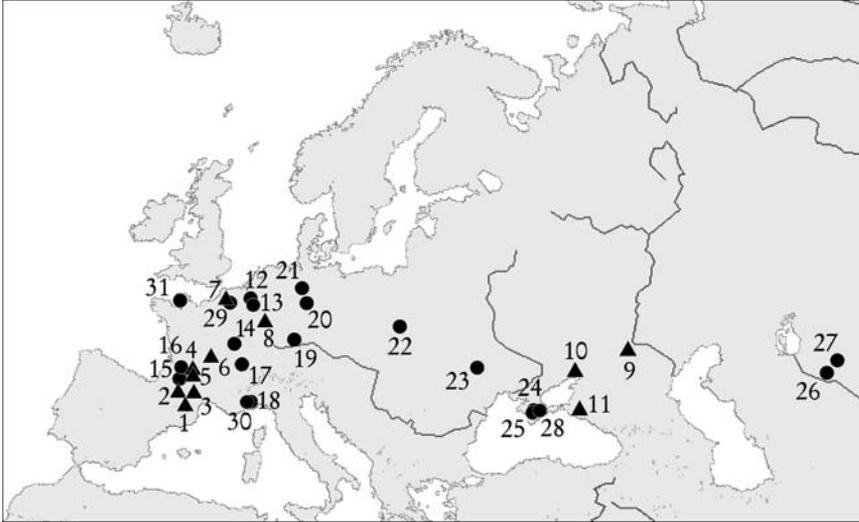


Figure 1. Monospecific or species dominated faunal assemblages: 1 Mauran (Farizy *et al.* 1994), 2 La Borde (Jaubert *et al.* 1990), 3 Coudoulous (Brugal 1999), 4 Les Fieux (Brugal and Jaubert 1996), 5 Le Roc (Brugal and Jaubert 1996), 6 Champlost (Farizy and David 1992) 7 Hénin-sur-Cojeul (Marcy *et al.* 1993), 8 Wallertheim (Gaudzinski 1995), 9 Sukhaja Mečetka (Vereščagin and Kolbutov 1957), 10 Rozhok (Praslov 1968), 11 Ilskaja (Hoffecker *et al.* 1991), 12 Labri Sandron (Fraipont and Tihon 1896), 13 Grotte du Docteur (Ulrix-Closset 1975), 14 Genay (Patou 1987), 15 Combe Grenal 22, Combe Grenal 50 (Bordes and Prat 1965, Chase 1986), 16 Haute Roche 1 (Bouchud 1966), 17 La Chaise de Vouthon (Bouchud 1966), 18 Grotte du Lazaret (Valensi 2000), 19 Vogelherd VII (Lehmann 1954), 20 Taubach (Bralund 2000), 21 Salzgitter Lebenstedt (Gaudzinski 1999), 22 Zwoleń (Schild *et al.* 2000), 23 Ripičeni-Izvor (Paunescu 1965), 24 Čocurča (Formozov 1959), 25 Starosel'e (Gabori 1976), 26 Tesik Tas (Gromova 1940), 27 Aman Kutan (Bibikova 1958), 28 Kabazi (Burke 1999), 29 Biache St. Vaast (Auguste 1995), 30 Caune d'Arago (Moigne 1999), 31 La Cotte de St. Brelade (Callow and Cornford 1986).

as well as assemblages for which recent taphonomic re-evaluation was undertaken, indicate that the fact that these thanatocoenoses appear quite similar does not imply that the exploitation strategies behind them are necessarily identical. This will be shown by the following examples.

Bovoid-Dominated Faunal Assemblages

Numerous large bovid-dominated faunas are known from the earlier part of the Weichselian throughout Europe, e.g., Mauran (Farizy *et al.* 1994), La Borde (Jaubert *et al.* 1990) in France or Wallertheim in Germany (Gaudzinski 1995) (see Figure 1). The sites are spread across Europe, showing that bovid dominance is not regionally restricted. All these sites (Figure 1) have been interpreted as kill sites. Their lithic assemblages consist mainly of unmodified flakes,

denticulates, and simple scrapers produced *ad hoc* from locally available raw material. Zooarchaeological studies of bovid age patterns at these sites have indicated dominance of individuals at the height of their reproductive life, with only a low proportion of very old bovinds. Where data are available, sex composition is typical of a living herd during rutting season.

The exploitation of the bovid carcasses by hominids followed a uniform strategy of bone breakage for marrow extraction. A comparative consideration of hammerstone-induced impact notches associated with marrow processing illustrates a uniform strategy across geography and time. Blows were positioned at the weakest part of the bone so as to take advantage of natural bone fracture properties. This method of bone fracture for the extraction of marrow can be seen into the Holocene (Gaudzinski 1996).

Data from bovid ethology as well as the prime age composition of the thanatocoenoses suggest that these assemblages may reflect selective, controlled, and systematic exploitation of bovinds over what might have been a long period of time, indicating that the occupants of these sites were capable of repeated communal hunts (Gaudzinski 1996). For Mauran, the excavators estimate that the site must contain the remains of approximately 4,000 bison (Farizy *et al.* 1994). Where data are available, there are no indications for seasonally restricted hunting, nor an apparent preference for a particular topographic position of the sites.

The Exploitation of Rhinos at Taubach

That subsistence tactics behind monospecific faunal assemblages were variable is indicated by the Eemian, Oxygen Isotope Stage (OIS) 5e travertine site of Taubach in Germany (see Figure 1). Taubach is located *ca.* 4 km south-east of Weimar. The site's long history of investigation started in the 19th century, when the travertine exposure, covering merely 0.2 km², was still exploited (Kahlke 1977).

The faunal assemblage studied to date consists of approximately 4,500 bones, among which the following species are represented: *Castor fiber*, *Canis lupus*, *Ursus arctos*, *Ursus spelaeus*, *Meles meles*, *Lutra lutra*, *Crocota crocuta*, *Lynx lynx*, *Panthera pardus ssp.*, *Panthera leo spelaea* or *cf. spelaea*, *Elephas antiquus*, *Equus taubachensis*, *Stephanorhinus kirchbergensis*, *Stephanorhinus hemitoechus*, *Sus scrofa*, *Megaloceros giganteus*, *Dama dama*, *Cervus elaphus*, *Alces latifrons*, *Capreolus capreolus*, *Bison priscus* and *Bos primigenius*. The faunal assemblage was collected over several years from the same location and was not uncovered during excavations. The sample is definitely biased against certain species and skeletal elements. *Stephanorhinus kirchbergensis* (Number of Identifiable Specimens [NISP] 1,224, Minimum Number of Individuals [MNI] = 76) and *Ursus arctos* (NISP 1,537, MNI = 51) dominate, followed by bison (NISP = 533, MNI = 17) and beaver (NISP = 319, MNI = 10). Numerous bones with cut marks (rhinoceros NISP with cut marks: 99 ~ MNI = 10; brown bear NISP with cut marks: 292 ~ MNI = 9; bison NISP with cut marks:

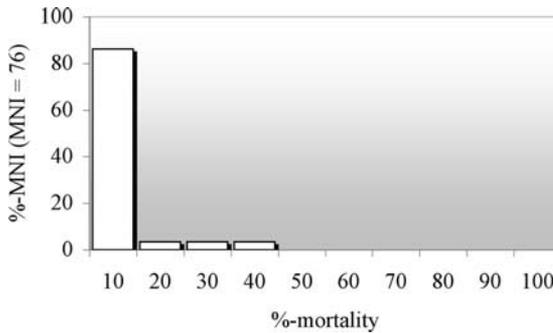


Figure 2. Taubach. Age profile for rhinoceros. Data from Bratlund (2000).

25 ~ MNI = 2; beaver NISP with cut marks: 10 ~ MNI = 2) point to extensive exploitation of these resources by hominids (Bratlund 2000).

The Taubach sequence yielded an undisturbed archaeological horizon represented by a sandy travertine formation. From this layer 900 artifacts were recovered as well as numerous large mammal bones. The presence of several hearths was reported. The mammal bones were obviously deposited in close association with the hearths, as indicated by a number of calcined and burned bones (Bratlund 2000).

This assemblage is dominated by an animal with a predominantly solitary life-style—*Stephanorhinus kirchbergensis*—which is represented by at least 76 individuals. As shown by Bratlund's (2000) recent detailed study of the Taubach assemblage, bones of this rhinoceros bear abundant traces of hominid interference, especially in the form of cut marks.

According to Bratlund (2000) the age structure for rhino is striking, and is characterized by a very high percentage of young and sub-adult individuals (Figure 2). Juveniles or young sub-adults between 1 and 1.5 years old are present with an MNI of 44 in addition to 7 older sub-adults. Only 25 old sub-adults are represented, and old individuals are absent. On the basis of the age structure Bratlund argues that an accumulation such as the one seen at Taubach has to be explained by selective hominid hunting activities of one individual at a time and repeated visits to the travertine lake area over quite a long period of time.

Exploitation of Reindeer at Salzgitter Lebenstedt

The German site of Salzgitter Lebenstedt indicates a subsistence pattern quite different from the one outlined above. For Salzgitter Lebenstedt we have indications that larger numbers of animals might have been taken at the same time, and that during subsequent processing of the slaughtered game Neandertals focused on better quality animals and prime anatomical parts.

Salzgitter Lebenstedt is situated in northern Germany (see Figure 1), about 50 km south-east of Hanover. The site is located where a narrow and steep valley joins the wide and flat glacial valley of the Fuhse, in a transitional zone between the *Mittelgebirge* and the North German plain. The site is dated to the earlier part of the last Glacial (OIS 5-3). Salzgitter Lebenstedt was excavated in 1952 and ca. 3,000 faunal specimens together with ca. 800 tools were uncovered.

With an MNI of 86, *Rangifer tarandus* (reindeer) dominated the fauna. Based on age estimates from analysis of complete mandibles, their age distribution was characterized by a high proportion of 8-year-old individuals (MNI = 20) as well as a relatively stable presence of pre-8-year-old animals (Gaudzinski and Roebroeks 2000). Mandibles yielded an MNI of 7 animals younger than 30 months corresponding well with the presence of 8 complete antler frontlets from juvenile reindeer as well as an MNI of 9 individuals younger than 30 months revealed by the study of 195 reindeer bones with unfused epiphyses.

Metric analysis of antler bases indicated that adult males were best represented in this assemblage (Figure 3). Given the condition of antler bases it was concluded that these animals probably died within a relatively short span of time during

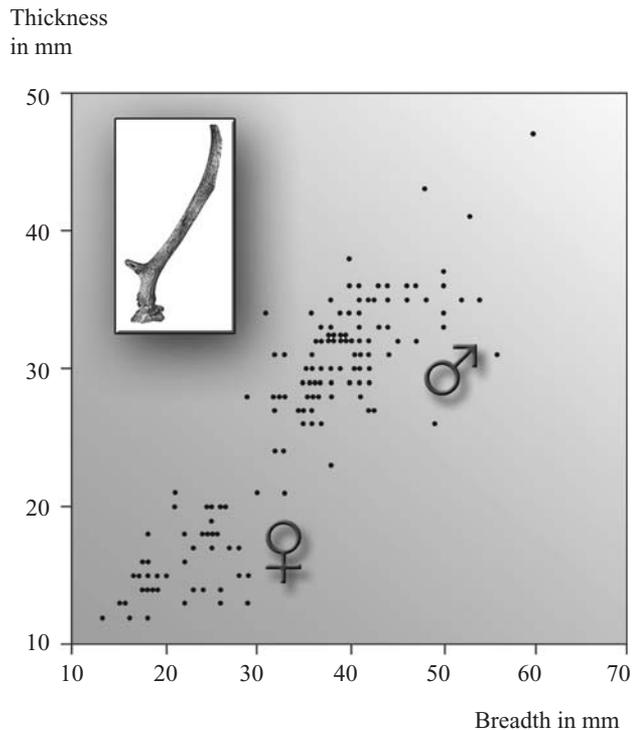


Figure 3. Salzgitter Lebenstedt. Thickness vs. Breadth for antler beams ($n = 135$). For position of measurements taken see Sturdy (1975, Figure 1, position 2).



Figure 4. Salzgitter Lebenstedt. Reindeer radius-ulna showing cut marks due to meat processing.

September- early October. This conclusion was supported by the state of dentition of young animals.

The reindeer remains display abundant evidence of meat processing and of very standardized marrow processing (Figure 4). During marrow processing there was a clear selection against sub-adults as well as against parts with low marrow

content. This is indicated by the proportion of exploited long bones from adult individuals to unexploited long bones from juvenile/sub-adult animals. While adults were clearly preferred, adult bones with low marrow content were excluded from use (Gaudzinski and Roebroeks 2000).

Traces of carnivore modification were only marginally present, and the faunal remains are characterized by homogeneous and excellent preservation. The best explanation for the evidence seems to be that we are dealing with seasonal but unselective killing of animals with subsequent selective exploitation of only high quality nutritional resources.

The topographic setting of Salzgitter in a small, steep valley which joins a major wide river valley is extremely well suited for hunting reindeer: in that it is comparable to the German Late Glacial Upper Paleolithic sites of Meiendorf and Stellmoor. These Late Glacial assemblages also show a remarkable degree of similarity to Salzgitter in the physical treatment of reindeer prey (Gaudzinski and Roebroeks 2000).

Salzgitter provides indications of seasonally restricted exploitation of prey. This behavior is also recognized in other sites where prey specialization is evident. Burke's (2000) analysis of different occupation levels at the Crimean site of Starosel'e suggests a seasonal exploitation of family bands of *Equus hydruntinus* which, most interestingly, remained the subsistence strategy through time despite climatic changes and local evolution of the landscape.

DISCUSSION AND CONCLUSION

Even though monospecific faunal assemblages share some major characteristics, subsistence tactics which led to these accumulations were obviously quite varied. For the bovid-dominated assemblages, selective long-term exploitation of herd animals can be proposed, whereas at Taubach we see selective exploitation of rhinoceros, an animal with a predominantly solitary life style. Finally, exploitation of larger herds of reindeer, interpreted as mass-hunting, can be proposed for Salzgitter Lebenstedt.

Differences in exploitation strategies can be interpreted in terms of flexible resource utilization against a background of unstable environmental conditions. In terms of behavioral evolutionary models, the flexibility observed in subsistence tactics allows equivocal interpretations. It could reflect very efficient hominid adaptation to the environment, mere opportunism, or a combination of both.

However, in the case of Salzgitter Lebenstedt we could in fact show that at least the physical treatment and exploitation of reindeer prey characteristic for the Late Glacial were already practiced during the Late Middle Paleolithic (Gaudzinski and Roebroeks 2000). This does not necessarily imply that subsistence tactics were similar in the two periods. Data from other regions indicate that during the Late Glacial reindeer hunts must have been situated in a wider array of hunting site types and base camps (Baales 1996).

The frequent occurrence of monospecific assemblages during the Upper Pleistocene is striking, whereas such evidence is rare for the Middle Pleistocene.

For the entire Middle Pleistocene period only a handful of such assemblages (see Figure 1) is known. These include the French red deer-dominated Grotte du Lazaret (OIS 6) (Valensi 2000), the bovid-dominated open-air assemblage Biache St. Vaast (OIS 7c) (Auguste 1995), the reindeer-dominated fauna from level L of Caune d'Arago (OIS 14) (Moigne and Barsky 1999), and the mammoth-dominated fauna from La Cotte de St. Brelade on Jersey (OIS 7) (Callow and Cornford 1986).

To the extent that taphonomic studies have been carried out at these sites, it is obvious that subsistence tactics outlined for the Upper Pleistocene can also be found during the Middle Pleistocene. Mass mammoth hunting by driving is postulated for both levels 3 and 6 at the Saalian site of La Cotte, which are separated by intervening interstadial conditions. Quite in line with Upper Pleistocene bovid-dominated faunas, the record at Biache St. Vaast is considered to display selective and long-term exploitation of bovids. However, the current state of research does not enable an evaluation of whether subsistence tactics behind these assemblages are exceptional or representative for the entire Middle Pleistocene period. The differences in evidence before, during, and after OIS 7 correspond to major ecological changes during OIS 7 (e.g., Kahlke 1994), which could have resulted in shifts in hominid subsistence tactics. It is equally possible that post-depositional taphonomic destruction is responsible for the observed changes over time. Though the majority of monospecific faunal assemblages is dated to the earlier part of the Weichselian, the sites may in fact be separated by thousands of years. It is this relatively coarse chronological resolution which hampers more accurate evaluation of the mode and tempo of change, or even recognition of evolutionary trends in subsistence tactics from Middle Paleolithic monospecific faunal assemblages.

REFERENCES CITED

- Auguste P. 1995. Chasse et charognage au Paléolithique moyen: l'apport du gisement de Biache-Saint-Vaast (Pas-de-Calais). *Bulletin de la Société Préhistorique Française* 92: 155–167.
- Baales M. 1996. *Umwelt und Jagdökologie der Ahrensburger Rentierjäger im Mittelgebirge*. Bonn: Habelt.
- Bibikova V.I. 1958. Nekotorye zamečanija po faune iz must' erskoj pečery Aman-Kutan I. *Sovetskaja Archeologija* 3: 229–233.
- Bocherens H., D. Billiou, A. Mariotti, M. Patou-Mathis, M. Otte, D. Bonjean and M. Toussaint 1999. Palaeoenvironmental and paleodietary implications of isotope biochemistry of last interglacial Neandertal and mammal bones in Scladina Cave (Belgium). *Journal of Archaeological Science* 26: 599–607.
- Boëda E., J.-M. Geneste, C. Griggo, N. Mercier, S. Muhesen, J.L. Reyss, A. Taha and H. Valladas 1999. A Levallois point imbedded in the vertebra of a wild ass (*Equus africanus*): hafting, projectiles and Mousterian hunting weapons. *Antiquity* 73: 394–402.
- Bordes F. and F. Prat 1965. Observations sur les faunes du Riss et du Würm I en Dordogne. *L'Anthropologie* 69: 31–45.
- Bouchud J. 1966. *Essai sur le Renne et la Climatologie du paléolithique moyen et supérieur*. Périgeux: Magne.
- Boyle K.V. 2000. Reconstructing Middle Palaeolithic subsistence strategies in the south of France. *International Journal of Osteoarchaeology* 10: 336–356.
- Bratlund B. 2000. Taubach revisited. *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* 46: 61–174.
- Burke A. 1999. The fauna of Kabazi I: a Mousterian rock shelter. In V.P. Chabai and K. Monigal (Eds.), *Palaeolithic of Western Crimea*, Vol. 2 (ERAUL 87), pp. 1–27. Liège: Université de Liège.

- Burke A. 2000. The view from Starosele: faunal exploitation at a Middle Palaeolithic site in Western Crimea. *International Journal of Osteoarchaeology* 10: 325–335.
- Brugal J.-P. 1999. Middle Palaeolithic subsistence on large bovinds: La Borde and Coudoulous I (Lot, France). In *The Role of Early Humans in the Accumulation of European Lower and Middle Palaeolithic Bone Assemblages* (Monographien des Römisch-Germanisches Zentralmuseums 42), pp. 263–266. Bonn: Habelt Verlag.
- Brugal J.-P. and J. Jaubert 1996. Stratégie d'exploitation et mode de vie des populations du Paléolithique moyen: exemples des sites du sud de la France. *La Vie Préhistorique*, pp. 148–155. Paris: Editions Faton.
- Callow P. and J.M. Cornford 1986. *La Cotte de St. Brelade 1961–1978*. Norwich: Geo Books.
- Chase P.G. 1986. *The Hunters of Combe Grenal. Approaches to Middle Paleolithic subsistence in Europe*. (BAR International Series 285). Oxford: BAR.
- Conard N.J. and T.J. Prindiville 2000. Middle Palaeolithic hunting economies in the Rhineland. *International Journal of Osteoarchaeology* 10: 286–309.
- Farizy C. and F. David 1992. Subsistence and behavioural patterns of some Middle Paleolithic local groups. In H.L. Dibble and P. Mellars (Eds.), *The Middle Paleolithic: Adaptation, Behavior and Variability*, pp. 87–96. Philadelphia: The University Museum, University of Pennsylvania.
- Farizy C., F. David, F. and J. Jaubert 1994. *Hommes et bisons du Paléolithique moyen à Mauran (Haute Garonne)*. Paris: CNRS Editions
- Féblot-Augustins J. 1999. Raw material transport patterns and settlement systems in the European Lower and Middle Palaeolithic: continuity, change and variability. In W. Roebroeks and C. Gamble (Eds.), *The Middle Palaeolithic Occupation of Europe*, pp. 193–214. Leiden: Leiden University Press.
- Formozov A.A. 1959. Issledovanija po kamennomu veku Kryma v 1956 godu. Kratkije soobščeniija o dokladach i polevych issledovanijach instituta istorii material'noj kul' tury 73: 39–41.
- Gabori M. 1976. *Les civilisations du Paléolithique moyen entre les Alpes et l'Oural*. Budapest: Akadémiai Kiadó.
- Gaudzinski S. 1995. Wallertheim revisited: a re-analysis of the fauna from the Middle Palaeolithic site of Wallertheim (Rheinessen, Germany). *Journal of Archaeological Science* 22: 51–66.
- Gaudzinski S. 1996. On bovid assemblages and their consequences for the knowledge of subsistence patterns in the Middle Palaeolithic. *Proceedings of the Prehistoric Society* 62: 19–39.
- Gaudzinski S. 1999. Knochen und Knochengeräte der mittelpaläolithischen Fundstelle Salzgitter Lebenstedt. *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* 45: 163–220.
- Gaudzinski S. and W. Roebroeks 2000. Adults only. Reindeer hunting at the Middle Palaeolithic site Salzgitter Lebenstedt, Northern Germany. *Journal of Human Evolution* 38: 497–521.
- Gromova V.I. 1940. *Ostatki Mlekopitajuščich iz Peščery Tesik-Tas*. Moskva: Trudy Akademii Nauk SSSR.
- Hoffecker J.F., G. Baryshnikov and O. Potapova 1991. Vertebrate remains from the Mousterian site of Il'skaya I (Northern Caucasus, U.S.S.R.): new analysis and interpretation. *Journal of Archaeological Science* 18: 113–147.
- Jaubert J., M. Lorblanchet, H. Laville, R. Slot-Moller, A. Turo and J.-P. Brugal 1990. *Les Chasseurs d'Aurochs de La Borde*. Paris: Editions de la Maison des Sciences de l'Homme.
- Kahlke H.-D. 1977. *Das Pleistozän von Taubach bei Weimar*. Berlin: Akademie Verlag.
- Kahlke R.-D. 1994. *Die Entstehungs-, Entwicklungs-, und Verbreitungsgeschichte des Oberpleistozänen Mammuthus-Coelodonta-Faunenkomplexes in Eurasien (Großsäuger)*. Frankfurt: Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft.
- Kolen J. 1999. Hominids without homes: on the nature of Middle Palaeolithic settlement in Europe. In W. Roebroeks and C. Gamble (Eds.), *The Middle Palaeolithic Occupation of Europe*, pp. 139–176. Leiden: Leiden University Press.
- Lehmann U. 1954. Die fauna des "Vogelherds" bei stetten im Lohnetal (Württemberg). *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* 99: 33–146.
- Marcy J.-L., P. Auguste, M. Fontugne, A.V. Munaut and B. Van Vliet-Lanoë 1993. Le gisement moustérien d'Hénin-sur-Cojeul (Pas-de-Calais). *Bulletin de la Société Préhistorique Française* 90: 251–256.
- Moigne A.-M. and D. Barsky 1999. Large mammal assemblages from Lower Palaeolithic sites in France: La Caune de l'Arago, Terra-Amata, Orgnac 3 and Cagny L'Épinette. In *The Role of Early Humans*

- in the *Accumulation of European Lower and Middle Palaeolithic Bone Assemblages* (Monographien des Romisch-Germanisches Zentralmuseums 42), pp. 219–235. Bonn: Habelt Verlag.
- Paunescu A. 1965. Sur la succession des habitats paléolithiques et post-paléolithiques de Ripičeni-Izvor. *Dacia* 9: 5–31.
- Patou M. 1987. La grande faune de la Brèche de Genay (Cote d'Or). Fouilles de l'Abbé Joly. *L'Anthropologie* 91: 97–108.
- Patou-Mathis M. 2000. Neandertal subsistence behaviours in Europe. *International Journal of Osteoarchaeology* 10: 379–395.
- Pillard B. 1972. La faune des grands mammifères du Würmien II. In H. de Lumley (Ed.), *La grotte moustérienne de l'Hortus (Valflaunes, Hérault)*, pp. 163–206. Marseille: Etudes Quaternaires 1.
- Praslov N.D. (1968). *Rannij Paleolit Severo-Vostočnogo Priazov'ja i Nižnego Dona*. Leningrad: Akademii Nauk SSSR.
- Richards M.P., P.B. Pettitt, E. Trinkaus, E.H. Smith, M. Paunovic and I. Karavanic 2000. Neandertal diet at Vindija and Neandertal predation: the evidence from stable isotopes. *Proceedings of the National Academy of Sciences USA* 97: 7663–7666.
- Richards M.P., P.B. Pettitt, M.C. Stiner and E. Trinkaus 2001. Stable isotope evidence for increasing dietary breadth in the European Mid-Upper Palaeolithic. *Proceedings of the National Academy of Sciences USA* 98: 6528–6532.
- Roebroeks W. and A. Tuffreau 1999. Palaeoenvironment and settlement patterns of the northwest European Middle Palaeolithic, In W. Roebroeks and C. Gamble (Eds.), *The Middle Palaeolithic Occupation of Europe*, pp. 121–138. Leiden: Leiden University Press.
- Schild R., A.J. Tomaszewski, Z. Sulgostowska, A. Gautier, A. Bluszcz, B. Bratlund, A.M. Burke, H. Juel Jensen, H. Królik, A. Nadachowski, E. Stworzewicz, J.H. Butrym, J. Maruszczak and J.E. Mojski 2000. The Middle Palaeolithic kill-butchery site of Zwolen, Poland. In A. Ronen and M. Weinstein-Evron, (Eds.), *Toward Modern Humans: Yabrudian and Micoquian 400 - 50 k Years Ago* (BAR International Series 850), pp. 189–207. Oxford: Archaeopress.
- Shea J. 1998. Neandertal and early modern human behavioral variability. *Current Anthropology* 39 (Supplement.): 45–78.
- Speth J.D. and E. Tchernov 2001. Neandertal hunting and meat processing in the Near East: evidence from Kebara Cave (Israel). In C.B. Stanford and H.T. Bunn (Eds.), *Meat-Eating and Human Evolution*, pp. 52–72. Oxford: Oxford University Press.
- Stiner M. 1994. *Honor among Thieves: Zooarchaeological Perspectives on Neandertal Foraging Ecology*. Princeton: Princeton University Press.
- Sturdy D.A. 1975. Some reindeer economies in prehistory. In E.S. Higgs (Ed.), *Palaeoeconomy*, pp. 55–95. Cambridge: Cambridge University Press.
- Ulrix-Closset M. 1975. *Le Paléolithique moyen dans le Bassin Mosan en Belgique*. Wetteren: Universal.
- Valensi P. 2000. The archaeozoology of Lazaret Cave (Nice, France). *International Journal of Osteoarchaeology* 10: 357–367.
- Vereščagin N.K. and A.A. Kolbutov 1957. Ostatki živothnyh na must'erskoj stojanke pod Stalingradom i stratigrafičeskoe položenie paleolitičeskogo sloja. *Trudy Zoologičeskogo instituta Akademii Nauk, SSSR* 22: 75–89.