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TRACKING THE REINDEER: THE UPPER AND FINAL PLEISTOCENE RECORD OF REINDEER IN THE NORTHERN UPLANDS AND ITS SEASONAL IMPLICATIONS

Abstract

This contribution compiles the findings of antler assemblages of female/subadult reindeer in the northern uplands that I have come across, starting from the three Ahrensburgian sites with faunal remains located on the northern edge of the central European uplands and their clear evidence for reindeer hunting during spring season. In my opinion, the presented record proves for major parts of the Upper and Final Pleistocene – and even after interruptions due to climate and environmental changes – a regular pattern of reindeer herds migrating between their winter pastures in the north-western European lowlands and their summer pastures in the northern uplands to the south. This describes a complementary scenario to the Ahrensburgian model I developed some 30 years ago. However, no matching evidence is at hand for the Neuwied Basin Late Magdalenian.

Keywords

Central Europe, Upper and Final Palaeolithic, pleniglacial, Younger Dryas, spring migration

AN INTENSE WEEKEND

After spending the winter term 1986/1987 at what was called at that time *Institut für Jägerische Archäologie* (Archaeology of early Hunter-Gatherers) at the Eberhard Karls University of Tübingen, Gerhard Bosinski suggested that I could study the Ahrensburgian assemblage excavated below the so-called *Kartstein Felswand* (i. e., Kartstein rock-shelter) in the northern Eifel uplands for my Master's thesis at Cologne University (Baales, 1989). As a teenager, in 1977, I read about the Kartstein excavations in the newspapers, but despite my general interest in the history of my home region and beyond, I did not visit the site to witness the field work that was conducted at this time, even though my hometown was located in the near vicinity of the *Kakushöhle*[1] (used synonymously to the Kartstein; cf. Baales, 1996: 12), which I had known since childhood. However, if I had visited the excavations supervised by Hartwig Löhr, I could have met Elaine Turner and Martin Street, who worked at the site (Löhr, 1978). Instead, it was seven years later that I met them in Neuwied-Monrepos while I attended my first excavation at the Plaidter Hummerich volcano under supervision of Karl Kröger. During fieldwork, I stayed in the famous "Jagdhaus" at Monrepos for four weeks. Many years later, Martin published the results of the Plaidter Hummerich excavations (Street, 2002), while Elaine had already analysed some Hummerich animal remains as part of her PhD (Turner, 1995).

I got to know the two of them, and especially Martin, better, when I started to work on my Master's thesis after having returned to Cologne University from Tübingen in early 1987. Since the Final Palaeolithic assemblage of the Kartstein excavation mainly consisted of faunal remains, I had to learn zooarchaeological

1 "Cave of the Cacus giant" in Roman mythology, transferred in the mid-19th century to the northern Eifel region.

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Fig. 1 Crécy, northern France: Martin overlooking the battle field north of Abbeville[2]. – (Photo: M. Baales, August 1991).

methods. This was why and when Martin came into play, because Gerhard Bosinski suggested that I should meet with him in order to learn the basics. So we sat in Martin's office together for "a long, intense weekend" and surveyed the small-sized animal remains, mainly of reindeer and *Lagopus* that Martin and Elaine had unearthed ten years earlier during their Kartstein campaign. Of course, Martin was very interested in the material that he partly excavated as a student. This "long weekend" was essential to my early scientific work. It laid the ground work for becoming proficient in faunal studies, which I needed a lot in succeeding projects to come (cf. Baales, 2002).

While I worked more or less continuously in Monrepos from 1990 to 2002, a close and friendly relationship with Martin and Elaine, who both belong to the *Monrepos Urgestein* (i. e., 'Monrepos veterans'), developed. But above all, I have many memories of Martin and great gratitude for him in particular, because he published the first articles with me as a co-author in the English language, and translated several of my manuscripts – efforts that always resulted in significant and important improvements. But he also introduced me

2 During a trip to Belgium and northern France, in 1991 Martin and I also passed by the famous Crécy fields (Dép. Somme), where on August 26th in 1346 during the early phase of the Hundred Years' War, the English met the French and their allies for battle. Here, Martin explained to me where the English troops, with the famous teenage Black Prince in their rows, were positioned, how they attacked and how the French finally flew from the battleground. In this moment, I got the impression that Martin "saw" the battle turmoil from the lookout tower where we stood in front of his "spiritual eye" – and was very pleased we had made the little detour. Back then, in contrast to my English companion (because after all, at least his countrymen had won this fight, although not the war), I was not very familiar with the Hundred Years' War and the Battle of Crécy.

to many colleagues both at home and abroad. I still vividly remember one of our trips in 1991 that led to Liège and northern France (**Fig. 1**), visiting sites and ongoing excavations, meeting colleagues with whom we developed long-term scientific and friendly relations, and where we studied some important Palaeolithic collections.

AHRENSBURGIAN REINDEER HUNTERS IN THE NORTHERN UPLANDS

The cave of Remouchamps in the northern Belgian Ardennes was excavated as early as 1902, providing a rich archaeological assemblage – including numerous faunal remains, albeit mixed with some more recent material – that was later attributed to what has since been defined as Ahrensburgian. This accounts similarly for the Hohler Stein cave near Kallenhardt in the northern Westphalian *Sauerland* uplands that was excavated between 1928 and 1934, and for the early and quite unsystematic excavation at the Kartstein in 1913 which only provided a restricted number of objects later recognised as of Ahrensburgian age (Baales, 1996). But it would have not been possible to correctly contextualise these early finds without the innovative work of Alfred Rust (1900-1983), who excavated a site of reindeer hunters near Gut Stellmoor northeast of Hamburg from 1934 until 1936. His voluminous and detailed publication of the site defined the Ahrensburgian as a Final Palaeolithic "culture" of the northern central European lowlands (Rust, 1943).

Compared to the Stellmoor site, the sites of Remouchamps, Kartstein, and the Hohler Stein near Kallenhardt – all situated in the northern upland ranges (i.e., *Mittelgebirge*) – were clearly exceptional. Only thanks to new field campaigns at Remouchamps in 1969/1970 (Dewez, 1974) and at the Kartstein in 1977 could this picture be corrected, showing that the northern *Mittelgebirge* were also part of the Ahrensburgian economy (Baales, 1992, 1993, 1996, 1999).

Whereas Rust (1943) provided evidence for seasonal hunting at Stellmoor during autumn, data for the seasonality of Ahrensburgian presence in the uplands were scarce. When presenting the Ahrensburgian assemblages from Vessem, west of Eindhoven in the southern Netherlands, Nico Arts and Jos Deeben (1981: Fig. 53) forwarded a model that postulated north-south migrations (and *vice versa*) of prey and humans during the Final Palaeolithic. Hunter-gatherers at that time would have "hibernated" together with their prey in the adjacent southern uplands. This simple model, however, had already been rejected by the seasonal data available from Remouchamps in 1974, when Jean Bouchud (1974: 126) described two reindeer milk teeth which, due to their wear, indicated the *période estivale* (summer half year) as the hunting season. This estimation was later clarified by Bryan C. Gordon (1988: 215) who argued in favour of hunting during spring, based on his interpretation of annual cement increment analysis of eight reindeer teeth from the site.

My studies of the three most important Ahrensburgian faunal assemblages in the northern upland ranges in the early 1990s supported Gordon's seasonal interpretation of Remouchamps. Based on the presence of female/subadult reindeer antlers (mostly shed antlers and a few *bois de massacre,* which feature evidence of bone resorption at the junction of the antler and the pedicle), the evidence for dentition changes from milk to permanent teeth in young reindeer, and on the analysis of annual cement increments (available only for the Kartstein), plus comparative considerations on recent reindeer and caribou ethology and migration patterns, it was possible to argue for the interception of reindeer herds by Ahrensburgian hunters during the animals' spring migration into the northern uplands (Baales, 1996, 1999). In consequence, this implied that the Arts and Deeben model that postulated migration between the Eifel/Ardennes and the adjacent lowlands to the north, was "upside down", and that this pattern extended to Westphalia and most likely even further east. Since there are no other Ahrensburgian sites that preserved faunal remains in the region,

this model has not yet been contradicted. However, it remains to be seen whether new sites uncovered in the future and/or modern analyses of the known material (e. g., isotope studies of reindeer teeth; cf. Price et al., 2017) will open new perspectives on this topic.

PRESENCE OF UPPER PLEISTOCENE REINDEER IN THE NORTHERN UPLANDS AND THEIR SEASONAL IMPLICATIONS

In my now almost 30 year old Cologne PhD (from late 1992; Baales, 1993, 1996), I already discussed some particular findings of Upper/Late Pleistocene reindeer in the northern uplands, the accumulation of shed antlers of female/subadult animals and their importance for the reconstruction of reindeer seasonality (Baales, 1996: 97-100, 303-306). Since then several more finds came to light or could be substantiated. In the following, I will give an updated overview of this evidence (**Fig. 2**), although this compilation cannot claim for completeness at all.

The Ardennes (Belgium)

Numerous caves, some of which were frequently visited by Palaeolithic hunter-gatherers, are known from the northern slope of the Ardennes in southern Belgium (Dewez, 1987). In these caves several archaeological and/or palaeontological find horizons have produced large quantities of shed antlers of female/subadult reindeer, which has been stated expressly and repeatedly (Dewez, 1980: 93: "Le problème des bois de chute de renne femelle amassés sur les sites […]"). This applies similarly to the caves of Trou des Blaireaux à Vaucelles (Bellier and Cattelain, 1986, 1987; Charles, 1994: 34-38; Cattelain, 2001; **Fig. 3**), Trou des Nutons (Furfooz: Dewez, 1987: 190; Charles, 1994: 223-224), Trou de l'Ossuaire/Presle (Aiseau) (recent excavations: Léotard and Otte, 1988: 192-193; **Fig. 4** and older finds from smaller caves located there: Dewez, 1980: 93, 1987: 28) and the Grotte du Coléoptère (Bomal-sur-Ourthe: Dewez, 1980, 1987: 404; Gordon, 1988: 93; Charles, 1994: 315; **Fig. 5**). The famous cave of Spy also produced numerous reindeer antlers, but also one shed antler of a reindeer bull exhibiting gnawing marks (Germonpré et al., 2013: 308, 319), while the Grotte de Sy Verlaine, a cave some 3 km north of the Grotte du Coléoptère, produced only a few reindeer antler fragments, but at least one with a shed base of a juvenile/subadult individual dated to the Late Magdalenian (Charles, 1994: 330-331). During my visit to the Prehistoric collections of the University of Liège in 1992 and our joint visit there one year before, Martin and I were able to study some of these finds first-hand.

The relevant finds are generally dated to the later Upper Pleistocene and often associated with the Late Upper Palaeolithic Magdalenian techno-complex (cf. Miller and Noiret, 2009: 40-41). The two find horizons II and III of Trou des Blaireaux, for example, each "caractérisent par l'abondance de fragments de bois de rennes femelles" (Cattelain, 2001: 36), date ~ 14-12.5 kyr cal BC according to the available radiocarbon dates. The basal layer, which likewise produced many slender reindeer antlers, gave even older ages of ca. 17 kyr cal BC, which are believed to date a non-anthropogenic accumulation of faunal remains in the cave, which accumulated over a longer period of time (Voeltzel, pers. comm. 18.03.2020). Basically, all the antler collections in Trou des Blaireaux are expected to be of natural origin (Cattelain, 2001; Cattelain and Voeltzel, 2000; Voeltzel, pers. comm. 18.03.2020), while potential human modifications (Bellier and Cattelain,

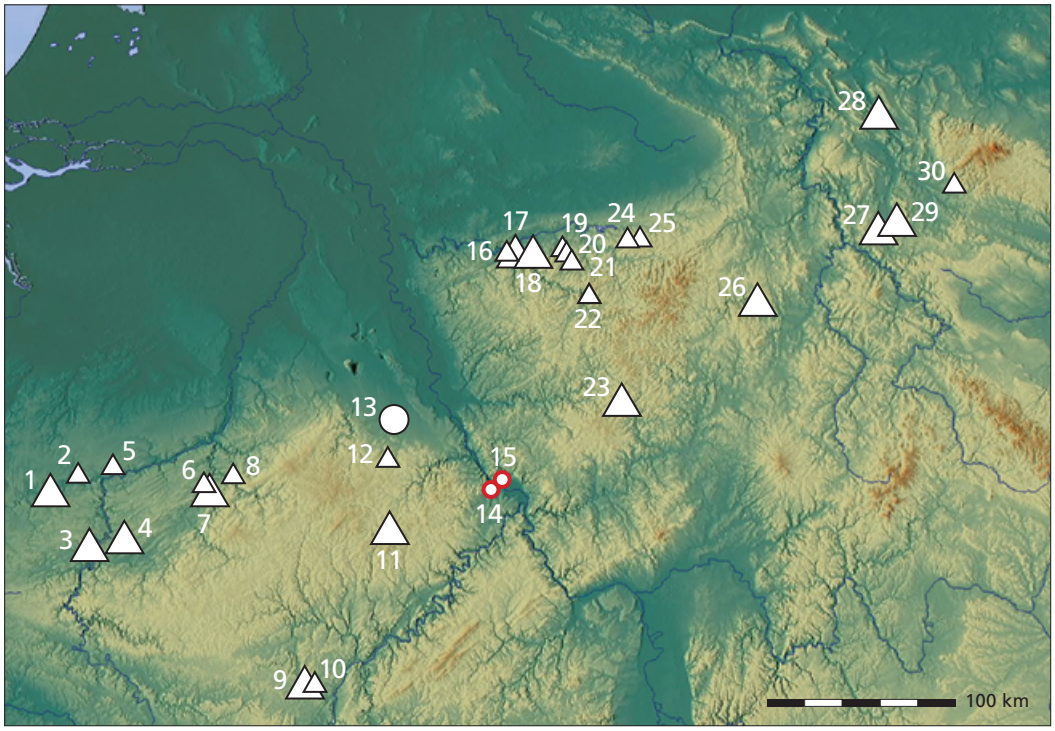

Fig. 2 The northern upland ranges (*Mittelgebirge*) between the Ardennes and the Harz with sites discussed in the text. Large triangles represent major collections of slender shed reindeer antlers, small triangles show sites that produced single specimens; large dot: Lommersum located just north of the upland edge; small dots: Late Magdalenian sites of Andernach-Martinsberg and Gönnersdorf in the Neuwied Basin. **1** Trou de l'Ossuaire/Presle near Aiseau (B); **2** Grotte de Spy near Jemeppe-sur-Sambre (B); **3** Trou des Blaireaux near Vaucelles (B); **4** Trou des Nutons near Furfooz (B); **5** Grotte Princess Pauline near Marche-Les-Dames (B); **6** Grotte de Sy Verlaine near Tohogne (B); **7** Grotte du Coléoptère near Bomal-sur-Ourthe (B); **8** Grotte du Remouchamps near Aywaille (B); **9** Schlaed/Schléd near Oetringen/Oetrange (LUX); **10** Kakert near Oetringen/Oetrange (LUX); **11** Magdalenahöhle and Buchenloch near Gerolstein (D); **12** Kartstein near Mechernich-Weyer (D); **13** Lommersum near Weilerswist (D); **14** Andernach-Martinsberg (D); **15** Gönnersdorf near Neuwied (D); **16** Hünenpforte near Hagen-Hohenlimburg (D); **17** Oeger Höhle near Hagen-Hohenlimburg (D); **18** Martinshöhle or Grürmannshöhle near Iserlohn-Oestrich (D); **19** Feldhofhöhle (questionable, see text) near Balve (D); **20** Volkringhauser Höhle near Balve (D); **21** Balver Höhle near Balve (D); **22** Fretter Höhle near Finnentrop (D); **23** Wildweiberhäuschen near Haiger-Langenaubach (D); **24** Bilsteinhöhle near Warstein (D); **25** Hohler Stein near Rüthen-Kallenhardt (D); **26** Edertal-Buhlen near Waldeck (D); **27** Abri Stendel XVIII near Friedland-Groß Schneen (D); **28** Aschenstein near Freden (D); **29** two abris in the Garte valley near Gleichen-Benniehausen (D); **30** Steinkirche near Herzberg am Harz-Scharzfeld (D). – (Map: M. Baales and M. Röring, Olpe; basis https://maps-for-free.com).

1987: 252) are today argued to result from natural processes (Charles, 1994: 36; Cattelain and Voeltzel, 2000). Altogether, the finds are proof of the recurrent presence of reindeer herds (or at least numerous female/subadult animals) during their spring migration into the Ardennes.

Other seasonal indicators on reindeer remains from Upper Palaeolithic sites of the Ardennes tend to give a more heterogeneous picture. The teeth of very young animals from the Magdalenian YSS assemblage of the Grotte du Bois Laiterie show no or only weak wear which "suggest occupation in the warmer period of the year, during the calving season of reindeer or shortly thereafter" (Gautier, 1997: 191). This interpretation is more or less supported by the analysis of the annual cement increments of reindeer teeth from Bois de Laiterie and further sites in the Ardennes (Stutz, 1997: 201; cf. Gordon, 1988, who defines the Ardennes as an Upper Pleistocene reindeer "calving ground" based on his results of annual cementum layers). The same method, applied on reindeer teeth from the Aurignacian at Trou Magrite near Dinant, however, points

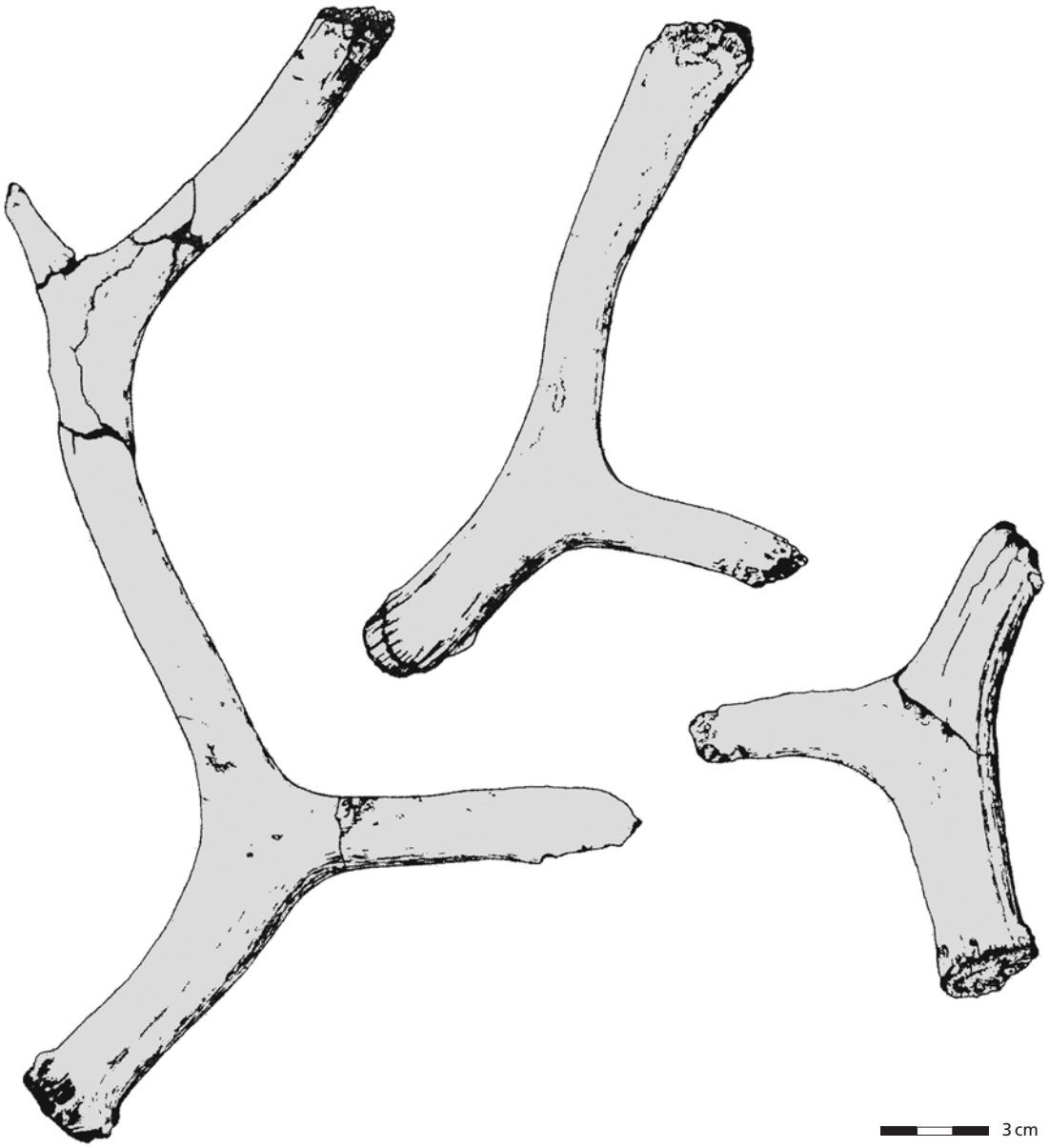

Fig. 3 Trou des Blaireaux near Vaucelles (southern Belgium). Three fragments of shed slender reindeer antlers. – (Drawing: H. Menne, Olpe, modified from Bellier and Cattelain, 1986).

to reindeer hunting during the cold season (Gautier, 1995: 149) or – more specifically – in late winter/early spring (Stutz et al., 1995: Tab. 9.2). Other Upper Pleistocene reindeer teeth from the region also indicate (late) winter/early spring as the time of death, although other seasons are occasionally indicated (Stutz et al., 1995: Tab. 9.3, 9.4). The not fully developed reindeer antler from the Aurignacian of the Grotte Princess Pauline (Marche-Les-Dames), on the other hand, is again considered to indicate hunting of reindeer during late spring/summer (Gautier, 1995: 150).

Those rather heterogeneous seasonal findings are sometimes interpreted as evidence for the "year-round" reindeer hunting in the Ardennes during the Upper Pleistocene. By reading the discussions of the annual cement increments in the cited studies, to me it seems, however, that the referred findings in reindeer tooth sections were not easy to interpret or do not always provide an unambiguous interpretation. Using

improved analytical methods, future research could perhaps provide a clearer picture (cf. Stutz et al., 1995: 181). Although the annual cement increments analysis give evidence for the presence of reindeer herds in the Ardennes upland during their bi-seasonal migration periods, at present, the collections of shed reindeer antlers of female/subadult individuals represent the most significant seasonal evidence (Germonpré, 1993: 292) for the presence of reindeer herds in the Ardennes. They refer to multiple spring migrations of large herds with many female and young individuals on their way to their summer pastures in the higher Ardennes during the Upper/Late Pleistocene.

The Gutland (central and southern parts of the Grand Duchy of Luxembourg)

Similar findings as for the Belgian caves can be demonstrated for the Luxembourg Gutland further southeast. Decades ago, in a cave-diaclase in the Triassic sandstone near the village of Schlaed/Schléd (Oetringen/Oetrange), roughly 250 fragments of shed antler of female/subadult reindeer were recovered (**Fig. 6**) in addition to numerous other Upper/Late Pleistocene animal remains (Heuertz, 1969: 104, Fig. 44). In 1969, a bulked antler sample was dated by radiocarbon (Heuertz, 1969: 135) to ~17.5 kyr cal BC. The site of interest is located some 150 km south of the northern upland edge and is thus situated significantly further south than the cave sites in the Belgian Ardennes.
From a neighbouring cave-diaclase named Kakert, in 2008 a reindeer tooth was AMS-dated to ~19 kyr cal BC (Fabre, 2010: 324); nine reindeer shed antler fragments and one *bois de massacre* were identified from there, most likely coming from female/subadult individuals (Fabre, 2010: 327, 330). However, other

Fig. 4 Presle near Aiseau (southern Belgium). Fragments of reindeer antlers, among them three with shed bases. – (Photo: M. Baales, 1991). – Scale approx. 1:2.

seasons of death are also discussed based on a few diagnostic reindeer teeth and unfused bones (Fabre, 2010: 329-331).
Apparently, the collections of reindeer antlers found near Oetrange might have been analogous to those found in the Oeger Höhle in Westphalia (see below), accumulated over many millennia. I interpret this as evidence of countless reindeer migrations into the region where the antlers were found. It should be noted here that, even some ~ 100 km further south-west, numerous shed antler of female/subadult reindeer were excavated at the site of Roche Plate near Saint-Mihiel in the Meuse valley in north-eastern France, dating to the Late Upper Palaeolithic and estimated to be of a natural origin (cf. Cattelain and Voeltzel, 2000; Patou-Mathis et al., 2005: 34; Stocker et al., 2006: 36).

West and North Eifel

Around 100 km to the northeast from Oetrange near Gerolstein (West Eifel, Rhineland-Palatinate), between 1969 and 1972 a hobby archaeologist uncovered numerous shed antlers of female/subadult reindeer (**Figs. 7-8**) in front of a small cave, known as the Magdalenahöhle (Magdalena Cave; Weiß, 2002). When I was working in Monrepos I had the opportunity to have a closer look at this material, which was published much later (Probst, 2012). In 1971 a bulked sample of reindeer antler fragments was radiometrically dated to ~ 29 kyr cal BC (BONN-1658). However, this date is to be assessed critically, since the archaeological material was recently connected to the Solutrean (Probst, 2012: 61-62).
From the nearby Buchenloch cave, situated in the same limestone cliff (named Munterley), Löhr reported further examples of slender shed reindeer antlers (Baales, 1996: 98-99). At any rate, it can be agreed that

Fig. 5 Grotte du Coléoptère near Bomal-sur-Ourthe (southern Belgium). Fragments of shed antlers of female/subadult reindeers. – (Photo: M. Baales, 1992).

Fig. 6 Schlaed/Schléd near Oetringen/Oetrange (Luxembourg). Collection of shed antlers of female/subadult reindeers. – (From Heuertz, 1969). – Scale approx. 1:3.

during the late Upper Pleistocene, female/subadult reindeer repeatedly shed their antlers in the Gerolstein area on their southward migration through the western Eifel uplands.

The seasonal indications for the Ahrensburgian layer uncovered in 1977 beneath the Kartstein Felswand in the North Eifel, barely 60 km southwest of Cologne and at about 400 m a. s. l., have already been mentioned above (Baales, 1996). Since the beginning of the last century the Middle Pleistocene Kartstein travertine with its various caves and rock shelter situations was frequently the target of archaeological surveys and excavations, which repeatedly revealed reindeer remains. Most of the finds uncovered during the quite often relatively unsystematic surveys have been lost. A reindeer antler fragment published as a sketch drawing

Fig. 7 Magdalenahöhle near Gerolstein (Rhineland-Palatinate, western Germany). Large fragments of three shed antlers of female reindeers. – (Photo: M. Baales, ca. 2000).

(Rademacher, 1916) was among the objects recovered in 1913 during the second field campaign at the Kartstein undertaken by Carl Rademacher (1859-1935). Due to its assumed anthropogenic status of an artefact the item was re-published much later by Karl Josef Narr (1952: 5). However, this basal antler fragment was certainly no artefact, but just a shed antler of a female/subadult reindeer, as the illustration reveals. This example can basically be used to suggest that reindeer were present around the Kartstein not only during the Younger Dryas, as Löhr's filed work documented, but regularly during Upper Pleistocene spring seasons. In addition to the upland sites with reindeer remains, presented above, the Aurignacian site of Lommersum near Weilerswist (distr. Euskirchen; Hahn, 1989) located some 30 km north of the Kartstein (thus, just north of the Eifel upland edge), is of relevance here. The Early Upper Palaeolithic find horizons are mainly characterised by the remains of reindeer (Matthies, 2013), while horse was less frequent. The zooarchaeological study by Hubert Berke (1989) demonstrated that reindeer were killed in the vicinity during their spring

migration. Is it not obvious that the herds intercepted near Lommersum were on their way southwards into the Eifel uplands, that could have served as summer pastures? The fact that the same season for reindeer hunting is argued for at the Final Palaeolithic Ahrensburgian site at the Kartstein a little further south but dating some 25 kyr younger, is of interest here.

Westphalian uplands (*Sauerland*) and northern Hessia

At the beginning of the 1930s, the Oeger Höhle in the Lenne valley near Hagen-Hohenlimburg (at the "gate to the *Sauerland* uplands"), was partially destroyed during road construction. From the remnant cave sediments, Josef Spiegel (1901-1984), founder of the later *Ruhrtalmuseum* in Schwerte, collected numerous slender reindeer antler fragments, including many basal parts of shed examples (**Fig. 9**). Many more specimens were collected over the coming years, sometimes during illegal excavations (cf. Niemeyer, 1992: 86-87; Baales, 1996: 99-100). About two decades ago, I was able to date two bulked samples of these antlers in the first radiocarbon facility at the University of Cologne. To my surprise, these measurements resulted in two completely different ages of around 13 and 30 kyr cal BC (Baales and Blank, 2013). Even though the chronostratigraphic value of the two age determinations is low, it is clear that the reindeer antlers were deposited over a longer period of time, spanning many millennia (similar observations have been made in a completely different region; see below; cf. Murray et al., 1993: 7).

Fig. 8 Magdalenahöhle near Gerolstein (Rhineland-Palatinate, western Germany). Further basal fragments of slender shed reindeer antlers. – (Photo: M. Baales, ca. 2000).

Unfortunately, the fragment of a barbed point found at Oeger Höhle, made from the split beam of a thin reindeer antler (**Fig. 10**), could not be dated by AMS-^{14}C due to low collagen content. The specimen, however, indicates that humans were present in the cave at roughly the time represented by the younger of the two conventional ^{14}C age determinations mentioned above. Interestingly, there are no further finds of Late Upper Palaeolithic age known from this locality.

In 1992, while studying the reindeer antlers from the Oeger Höhle in the former museum Hohenlimburg in Hagen, I recognized a further singular slender shed antler fragment from another former cave once located not far from the former Oeger Höhle within the same valley: the Hünenpforte (Baales, 1996: 284).

Since June 2002 (when I started my work in Olpe in Southern Westphalia), I have become aware of a whole series of cave sites in the *Sauerland* uplands, which produced shed antlers of female/subadult reindeer, sometimes in large quantities. These sites currently describe the region with the highest amount of finds of this kind in the Central European northern uplands.

In this region, the oldest record may even date back to the late Middle Palaeolithic (cf. Voeltzel, 2015), if one assumes that synchronicity of the reindeer antlers and the lithic artefacts found in the small Volkringhauser Höhle cave in the Hönne valley near Balve (Märkischer Kreis; Tafelmaier, 2011, 2013). The Hönne river runs south-north, contributing to the Ruhr about 25 km further north, and could be interpreted as a Pleistocene reindeer migration route on the way south into the Westphalian uplands.

Fig. 9 Oeger Höhle near Hagen-Hohenlimburg (southern Westphalia, western Germany). Collection of basal fragments of slender shed reindeer antlers. – (Photo: M. Baales, 1992).

Fig. 10 Oeger Höhle near Hagen-Hohenlimburg (southern Westphalia, western Germany). Fragment of a barbed point of reindeer antler. – (Photo: O. Jöris, MONREPOS, drawing: A. Müller, Olpe).

Furthermore, there is a series of yet undated collections of shed antlers of female/subadult reindeer. Many basal parts of shed antlers were found during early excavations in the Martinshöhle cave near Iserlohn-Letmathe east of Hagen. The cave, which was largely destroyed through quarrying in 1911, was located high up in the cliff, just where the valley of the Lenne bends southeast towards the southern *Sauerland*. Among others, the famous Bonn-based scholar Hermann Schaaffhausen (1816-1893) supervised the most extensive excavations in the Martinshöhle between 1875 and 1877 (Niggemann, 2018: 72-75) that revealed a large collection of Final Palaeolithic *Federmesser* material (Baales et al., 2013: 126). Given the Allerød interstadial age of the *Federmesser* industries within the wider region, the numerous reindeer antlers from the Martinshöhle should either pre- (Upper/Late Pleistocene) or postdate (Younger Dryas) the *Federmesser* occupation[3]. A collection of them (mostly labelled as "Schmitz, Letmathe 1889") is kept in the Geological-Palaeontological collection of the University of Münster together with a much more recent handwritten note about these finds coming from the Martinshöhle (**Fig. 11**).

In this context, it is worth noting, that in 1992, several skeletal remains of a female reindeer dated to > 46 kyr cal BC were found in the neighbouring Bunker Cave, below a sinkhole or a crack in the ceiling (Rosendahl and Tietgen, 1996). The skull displays both pedicles with adhering antler bases (**Fig. 12**). Due to its osteologi-

[3] The label "SCHMITZ, LETMATHE 1889" sticking on these antlers points to the pharmacist Schmitz from Iserlohn-Letmathe who supervised the Schaaffhausen excavations in the Martinshöhle during the 1870s, where reindeer antlers were found (Niggemann, 2018: 72-73). However, it cannot be ruled out whether or not the antlers stored in Münster actually came from another cave, the nearby Grürmannshöhle (Grürmann's Cave), where early excavations apparently exposed a huge amount of animal remains (Ziegler, 1973: 2). A larger collection of animal remains (mainly from Grürmannshöhle?) compiled by the pharmacist Schmitz was later given to the University of Münster (Niggemann, 2018: 77). A few of the antlers labelled "SCHMITZ, LETMATHE 1889" are on display in the Deutsches Höhlenmuseum near the famous Dechenhöhle in Iserlohn and have been assigned to come from the Grürmannshöhle.

Fig. 11 Martinshöhle (or Grürmannshöhle; cf. footnote 3) near Iserlohn-Oestrich (southern Westphalia, western Germany). Several basal fragments of slender shed reindeer antlers (Münster University collection). – (Photo: M. Baales, 2007). – Scale approx. 1:2.5.

cally reconstructed individual age of 30-36 months (Tietgen and Rosendahl, 1999), this animal died during winter or spring. The assigned anthropogenic manipulations on a tibia, however, need to be confirmed.

There are other caves in the *Sauerland* that produced accumulations of slender reindeer antlers worth mentioning. Several collections contain reindeer remains from the famous Balve Höhle cave in the Hönne valley. Again: this material subsumes numerous shed antlers of females/subadults, as is the case of the collection stored in the University of Münster (**Fig. 13**). These specimens have not been dated directly and might be considerably younger than the rich Late Middle Palaeolithic lithic and most of the remaining faunal assemblages of the Balver Höhle. However, these layers also provided a shed reindeer antler of a female/subadult animal (Kindler, pers. comm. 13.03.2020) with anthropogenic traces (Kindler, 2012: 201).

Slender antlers, recovered during the 19th century from a side chamber of the Bilsteinhöhle cave system near Warstein remain undated, too. Several typical shed antler bases of female/subadult reindeer have been preserved and are kept in the regional museum in Warstein (**Fig. 14**) and in the Münster University collections (**Fig. 15**).

In 2014, the *Südsauerland Museum* in Arnsberg in southern Westphalia handed over its archaeological collection (which was not to be displayed in the newly designed exhibition) to the magazine of my department in Münster-Coerde. When inspecting these finds, two slender antler fragments caught my attention.

Unfortunately, their labels indicated their origin from (a) *Sauerland* cave(s), without, however, specifying the cave name(s). The finds comprise a basal shed antler fragment and a small fragment of a *bois de massacre* with obvious features of bone resorption at the junction between antler and pedicle (**Fig. 16**). It is possible that these antlers come from one of the Hönne valley caves, perhaps the Balver Höhle, or from the equally large Feldhoferhöhle cave a bit further down the Hönne, which is situated high up in the valley cliff where early excavations and earthwork destroyed an important archaeological archive. In old descriptions, reindeer is mentioned as being part of the site's Late Middle Palaeolithic faunal list (Andree, 1928: 76-77). The basal fragment of a slender *sagaie* can be taken as an indication of a Late Magdalenian occupation in the cave (Baales et al., 2013: 111-112; **Fig. 17**).

Finally, decades ago, another small cave, the so-called Fretter Höhle near Finnentrop, fell victim to quarrying. The Fretter Höhle marks the southernmost Westphalian site of interest here, located in a valley that contributed to the Lenne river at Fretter. Years ago, I was able to survey a small collection of faunal remains from this cave (Baales et al., 2017: 22). Among the remains of woolly rhino and cave bear, there were also two antler specimens: a very slim shed one and a significantly larger *bois de massacre* (**Fig. 18**). While the former suggests the presence of reindeer during spring, the latter can be interpreted as an indication of a reindeer sojourn in the region during (late) summer/autumn. Due to its seasonality, the latter specimen is of special interest as it represents a different season from all the other antler remains in the region.

Just south of Westphalia' southern border in northern Hessia, countless fragments of slender shed reindeer antler were excavated from sediments below the Wildweiberhaus/Wildweiberhäuschen cliff (**Fig. 19**) south of Haiger and near Langenaubach (Behlen, 1905: 292: "unzählige Bruchstücke von Rentiergeweihen,

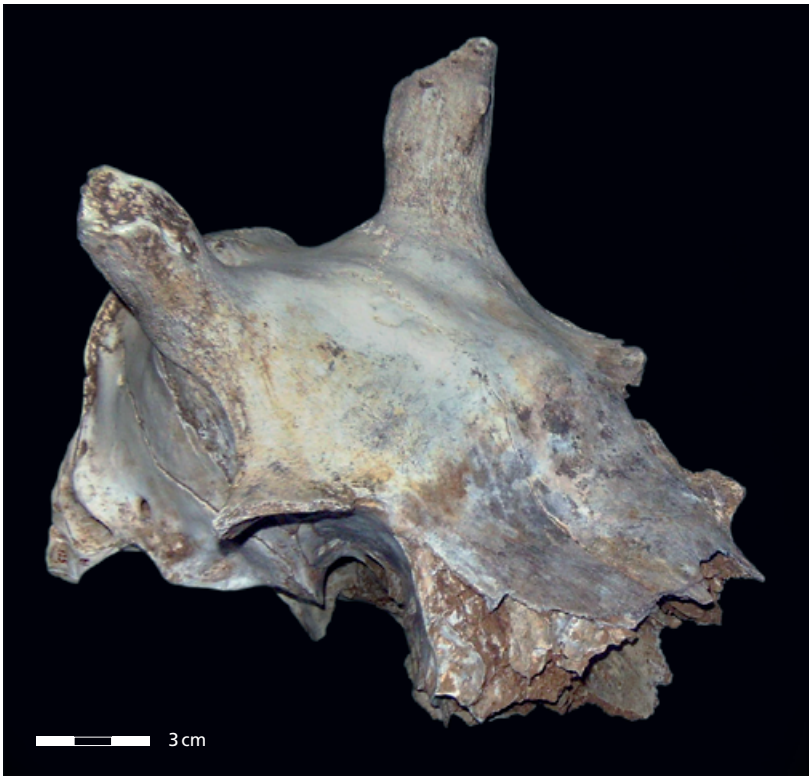

Fig. 12 Bunkerhöhle near Iserlohn (southern Westphalia, western Germany). Female reindeer skull cap. – (Photo: M. Baales, 2008).

Fig. 13 Balver Höhle near Balve (southern Westphalia, western Germany). Slender reindeer antler fragments (Münster University collection). – (Photo: M. Baales, 2007). – Scale approx. 1:2.

und zwar fast ausschliesslich abgeworfene Stangen jugendlicher Tiere"; cf. Jacobshagen, 1955: 38). The reindeer remains were found underneath a layer of Laacher See-Tephra (Jacobshagen, 1955: 41) dated to roughly 11 kyr cal BC (Reinig et al., 2020), and should hence belong to the late Greenland Stadial (GS) 2 time frame (cf. Rasmussen et al., 2014), a period for which as yet no human presence is known from the site or its vicinity. The Wildweiberhäuschen represents a remarkable parallel to the findings from the Aschenstein cliff around 200 km to the north-east in the uplands of Lower Saxony (see below).
The well-known Late Middle Palaeolithic site of Buhlen is situated About 100 km to the northeast of Haiger in the district Waldeck-Frankenberg in north-eastern Hessia. Here, the Upper Site (*Oberes Felsdach*) produced altogether 43 shed bases of slender reindeer antlers mainly assigned to the "Mousterian" *Fundkomplex Bu-II*. Further antler remains are present as well (Jöris, 2001: 115, 163-164). This site fills the gap between the Westphalian and Lower Saxon site-clusters.

Southern Lower Saxony: Leine Valley and Göttingen Forest

The unusual finding at the Aschenstein rock formation near in the Leine Valley has been known for a long time. Initially animal remains, particularly reindeer antlers, were discovered in 1959 in a dolomite quarry at the Aschenstein cliff, and many more were excavated together with lithic stone artefacts over the succeeding years. In 1999, there were 342 basal antler remains available (Terberger et al., 2009: Fig. 11), while I was able to record 127 basal shed antler fragments in the regional Alfeld/Leine Museum in 1992 (Baales, 1996: 305-306; **Fig. 20**).

In addition to the lithic artefacts that suggest human presence at the site during the Upper Palaeolithic (Terberger et al., 2009: 99), some antler fragments provide further proof of human activity (Terberger et al., 2009: 97). One of these artefacts has been dated to ~ 12.7 kyr cal BC and indicates a Late Upper Palaeolithic age. Two more radiocarbon dates – a conventional from 1981 (Cologne; bulk sample of reindeer bones and antlers) and another from the Kiel AMS facility – confirm the presence of reindeer in the region during a later stage of the Last Glacial Maximum (ca. 21 kyr cal BC; Terberger et al., 2009: 100).
When combined, these results compare well with the evidence from the Oeger Höhle and with the findings from the Wildweiberhäuschen in northern Hessia (see above), leading to the assumption that, at least for some millennia during the late Upper Pleistocene, reindeer herds moved up the northwest-southeast oriented Leine valley to spend their summers in the uplands of southern Lower Saxony and neighbouring

Fig. 14 Bilsteinhöhle near Warstein (southern Westphalia, western Germany). Three fragments of shed slender reindeer antlers (Warstein Museum collection). – (Photo: M. Baales, 2008).

regions. Despite the small number of artefacts from the Aschenstein site, they nevertheless can be taken as evidence that, most likely, hunter-gatherers repeatedly made use of this behaviour.

The Aschenstein findings are no isolated case in this region which, at first, was emphasized by an unexpected finding uncovered in 1997 in front of the Buntsandstein rock-shelter Stendel XVIII located in a small valley at an eastern tributary to the Leine river near Groß Schneen near Friedland south of Göttingen (Grote, 1998, 1999: 226-229, 2014: 20-23). After a geological survey, a trench was cut through the valley, uncovering some faunal remains from a sandy loess layer some 0.75 m below the late Allerød Laacher See-Tephra. Besides a typical Late Pleistocene faunal assemblage, the small-scale excavation uncovered around 220 fragments of reindeer antlers, which comprised several basal specimens of shed antlers of female/subadult animals (**Fig. 21**). Some of these are claimed to display traces of human manipulation (**Fig. 22**). Radiometric measurements indicate

Fig. 15 Bilsteinhöhle near Warstein (southern Westphalia, western Germany). Further fragments of shed slender reindeer antlers (Münster University collection). – (Photo: M. Baales, 2007). – Scale approx. 1:2.

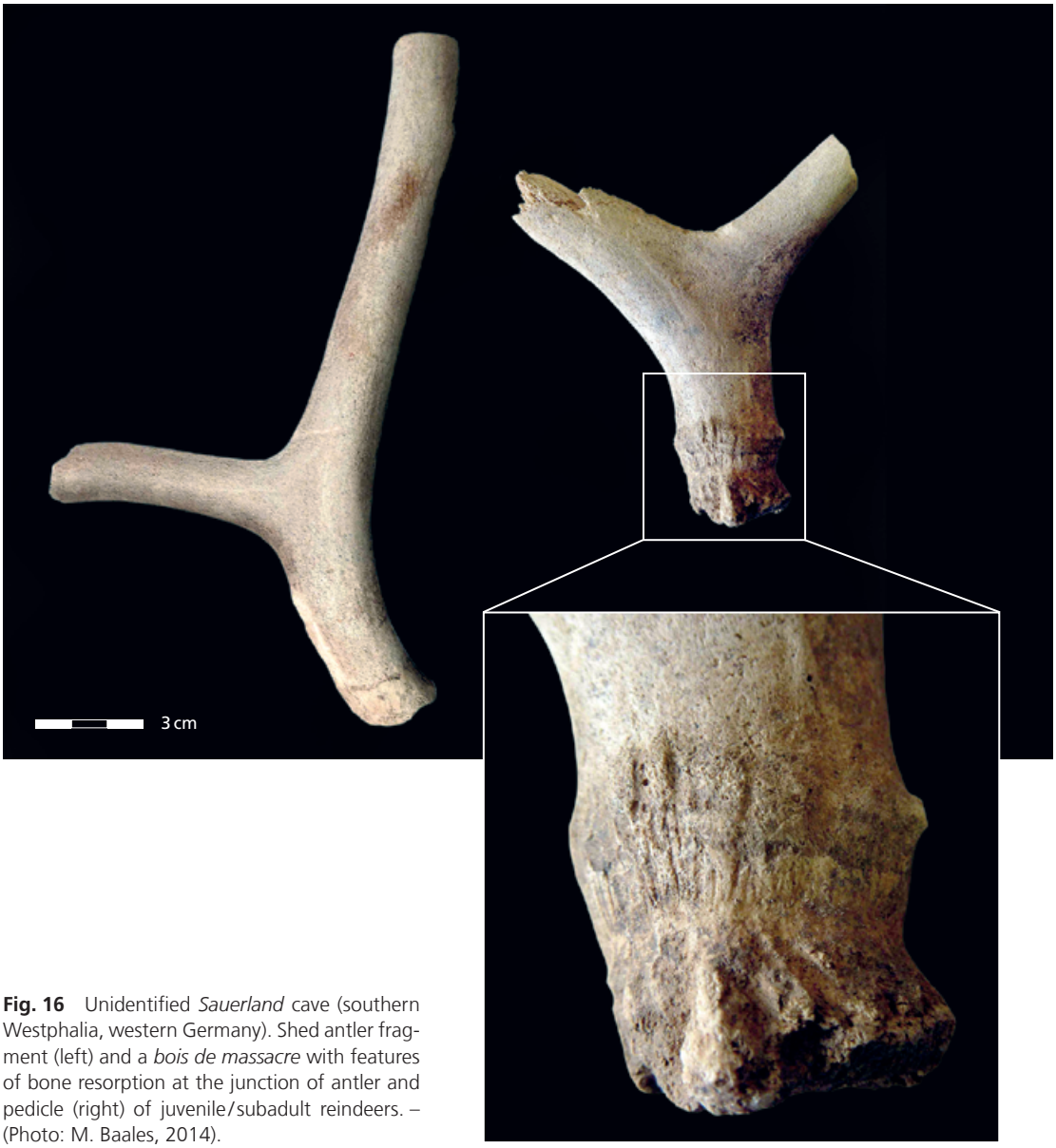

Fig. 16 Unidentified *Sauerland* cave (southern Westphalia, western Germany). Shed antler fragment (left) and a *bois de massacre* with features of bone resorption at the junction of antler and pedicle (right) of juvenile/subadult reindeers. – (Photo: M. Baales, 2014).

human habitation of the shelter during the Late Magdalenian ~ 13.2 kyr cal BC, apparently on the occasion of the spring migration of reindeer herds (Grote, 2014: 22; Terberger et al., 2009: 101).

By evaluating these and other comparable finds – there are two rock-shelters in the Garte valley near Benniehausen near Gleichen a few kilometers northeast of Friedland which also yielded collections of slender reindeer antlers (Grote, 1994: 326) and of a neonate reindeer calf uncovered below the Allerberg abri near Reinhausen (Grote, 1994: 326) – it can be assumed that, at least during the late Upper Pleistocene, reindeer herds took advantage of the Leine river valley and its tributaries during their spring migration on their way to their summer pastures in the southern Lower Saxony uplands. On their way south, the migrating herds were repeatedly intercepted by groups of hunters, as is further indicated by additional finds excavated below other rock-shelters in the Göttingen area (Grote, 1994, 1998, 1999, 2014; Staesche, 1994).

A little further to the east, slender shed reindeer antler fragments from a cave located on the south-western foothills of the Harz mountain should be mentioned here as well (Veil, 1988: 218).

Fig. 17 Feldhofhöhle near Balve (southern Westphalia, western Germany). Basal fragment of a slender *sagaie*. – (Photo: M. Baales, 2010).

GENERAL INTERPRETATION AND RESULTS

In the area considered here, from the Ardennes in the west to the southern Lower Saxony uplands to the east, there is a large amount of evidence of comparably large collections of shed antlers of female/subadult reindeer of Upper to Final Pleistocene age (Fig. 2). These finds are evidence for the presence of reindeer in the northern uplands during their spring migration and the warm season of the year. This seasonal pattern has been indicated even further to the east, where antlers of very young and female reindeer were reported from the Kniegrotte (Musil, 1974: 34, 44) as well as from the Teufelsbrücke (Musil, 1980: 5-6) near Saalfeld, both Magdalenian sites located in the valley system of the Saale on the northern edge of the Thuringian Forest. However, new seasonal studies for the regional Magdalenian would be of great interest[4], since the present evidence does not seem to be conclusive (cf. Höck, 2000: 35-36; Küßner 2009: 172).

The summarized evidence points towards a remarkable and diachronically rather stable migration pattern of reindeer herds between the upland summer pastures to the south and the winter pastures within the North-West European Plain to the north. This pattern seems to account for at least the Upper/Final Pleistocene of the region, i. e., over a period of tens of thousands of years. This furthermore indicates that the northern edge of the uplands can be regarded as reindeer calving grounds (cf. Murray et al., 1993). I find it highly interesting that this behaviour was re-established even after large time-gaps caused by major climatic and

4 In this context it would have been interesting to know whether there are any seasonal indications at hand for the Bärenkeller near Garsitz where Late Magdalenian reindeer antlers have recently been re-studied (Müller et al., 2020). Mario Küßner (2009: 30) claims that shed reindeer antlers were generally collected in the landscape by Magdalenian humans to be used as raw material. However, they are nevertheless indicative of reindeer presence during distinct seasons and should be described in more detail than has yet been done for the region. For Nebra there are indications on reindeer teeth that Magdalenian humans lived there during fall (Mania, 1999: 164).

environmental changes: As summarized above, the adaptation of people to migrating reindeer herds on their way to the northern uplands during spring season has been documented adequately for the Younger Dryas Ahrensburgian ~ 10 kyr cal BC (Baales, 1996). Similarly, this pattern appears to be applicable (at least for the Ardennes and the Lower Saxony upland ranges) for the Late Magdalenian ~ pre-12.5 kyr cal BC. But during the intermediate period, i. e., the moderate Late Glacial GI 1 which includes the Allerød Interstadial, completely different forested environments developed within the region considered here, followed by major changes in wildlife species composition (cf. Street and Baales, 1999; Baales, 2002). With the end of GI 1 the boreal forests collapsed (apparently very rapidly), and with the initial GS 1 populations of reindeer again expanded their habitats significantly to the south (including the northern upland ranges), resuming their earlier migration patterns.

Other seasonal data, particularly discussed for the Ardennes (see above), seems to be weakly supported or problematic at some points. They might also refer to scattered reindeer presence in the area during other seasons of the year or to animals gathering again to move northwards during the approaching autumn.

Fig. 18 Fretterhöhle near Finnentrop (southern Westphalia, western Germany). Basal fragments of shed female/subadult reindeer antler (left) and a *bois des massacre* of an adult male reindeer (right). – (Photo: M. Baales, 2010).

Fig. 19 Wildweiberhäuschen near Haiger-Langenaubach (northern Hessia, western Germany). View across the broad Aubach valley to the rock cliff in the back situated on the eastern side of the valley high above a small eastern tributary to the Aubach. – (Photo: M. Baales, 2020).

However, the evidence for seasons other than spring/early summer are by far less apparent than the numerous assemblages of female/subadult reindeer antlers recovered in the region mentioned here.

There are no comparable collections of antlers from reindeer bulls at all known from the region reviewed. For the northern uplands, no or only singular finds have been described or are known to me (see above), which might refer to reindeer herds that were present during the (late) summer or were on their way back northwards in autumn (or they represent artefacts). It could be argued that the large antlers of reindeer bulls, an important raw material for organic artefacts, were frequently used in the Upper Palaeolithic. However, unused bull antlers could not be found in Middle Palaeolithic horizons, nor are there any Upper Palaeolithic sites known in the area with considerable accumulations of waste remains from bull antler processing (cf. Dewez, 1987). Only very few, individual finds are available, if any at all (in the case of Trou des Blaireux: cf. Bellier and Cattelain, 1986: 56: "livré […] aucun fragment de bois de mâle adulte"; cf. Dewez, 1987: 190; Charles, 1994: 153).

When reindeer bulls shed their antlers after their rut (Germonpré, 1993: 292), the large autumn herds had already migrated from their upland summer pastures to the adjacent lowlands to the north. However, for the Central European lowlands adjoining the northern uplands, no detailed record of reindeer remains is available. In the case of the Westphalian lowlands, however, reindeer remains have repeatedly been described by palaeontologists (see 1980/1990s volumes of *Ausgrabungen und Funde in Westfalen-Lippe*), listing some *bois de massacre* and shed antlers, which were sometimes described as a representation of young adults. Besides a male antler frontlet from Greven-Bockholt dated to more than 45 kyr (Baales et al., 2019: Tab. 1) the only radiocarbon-dated example (~ 12.2 kyr cal BC) is a shed antler from a male reindeer

Fig. 20 Aschenstein near Freden (Lower Saxony, northern Germany). Pile of slender reindeer antler fragments (Alfeld/Leine Museum collection). – (Photo: M. Baales, 1992). – Scale approx. 1:2.

modified by humans from Castrop-Rauxel located some 20 km north of the Ruhr river and the northern edge of the uplands (Baales et al., 2019: 140-141). Two more examples of bull antlers could be identified as Lyngby axes, generally ascribed to the Ahrensburgian, but, unfortunately, it was impossible to date them directly by radiocarbon (Baales et al., 2019: 148-149).

Further information is available from the Flemish valley in northern Belgium, roughly 80 km north of the Ardennes. Here, reindeer remains were found, and among them were several *bois de massacre* interpreted as remains of bulls that died there after their autumn rut (Germonpré 1993, 292); some shed antlers extended the evidence for the presence of reindeer in the region into winter. A few shed antlers of females/subadult (males) are seen as a proof for the presence of young males during the winter or female animals during spring, in advance of their spring migration (Germonpré, 1993: 292). Altogether, there is evidence at hand that Upper and Final Pleistocene reindeer herds were present in the North European lowlands during the cold part of the year. This region could even have extended into what is today the southern North Sea region, which was dry land during that period (Glimmerveen et al., 2006; cf. Peeters and Momber, 2014).

When considering the topography of sites containing assemblages of female/subadult reindeer antlers, it is interesting to note that, apart from caves or abris close to the valley floor, others are located high up in the cliffs. This applies, for example, to the former Martinshöhle cave near Iserlohn-Letmathe, the Magdalenahöhle cave near Gerolstein, and the Buhlen II rock shelter. In such geomorphological settings, the presence of reindeer would normally not be expected. This leads to the question how such assemblages may have formed.

Fig. 21 Abri Stendel XVIII near Groß Schneen (Lower Saxony, northern Germany). Overview on the basal fragments of female/subadult reindeer antlers. – (Photo: K. Grote, Göttingen).

However, there are currently no new aspects available beyond what I already compiled from literature in 1996 (Baales, 1996: 100), as Klaus Grote already had done in 1994 (Grote, 1994: 326) and Thomas Terberger and colleagues in 2009 (Terberger et al., 2009: 98-99). Even if the latter favour the dominant influence of carnivores on the collections, there is, as far as I know, only one taphonomic study at hand – which was only published as a summary and is currently part of a PhD research project (Voeltzel pers. comm. 18.03.2020) – which discusses the influence of carnivore activities on some of the antler collections in depth. However, several authors (e. g., Cattelain and Voeltzel, 2000; and: Voeltzel pers. comm. 18.03.2020) claim that carnivore influence was, at best, only minimal (cf. Germonpré et al., 2013: 308). At the same time anthropogenic influence on these antler accumulations was either low or cannot be proven at all. Furthermore, I also was not able to find bite marks on the antlers I examined. On the material I have seen, the human impact was generally low (with few exceptions only: cf. Oeger Höhle or Aschenstein), although it might have been slightly higher at Abri Stendel XVIII.

This picture corresponds well with the situation at the famous Reindeer Cave in Scotland (Creag nan Uamh caves), located high above a valley. Here, a remarkable collection of slender reindeer antlers has piled up

over thousands of years, but any human interference on the formation process can be ruled out completely (Murray et al., 1993). We therefore have to consider this situation as a potential kind of "blueprint" for explaining the accumulation of reindeer antler at many of the sites described above. But a satisfying model that could explain the formation of these antler accumulations remains is still lacking (cf. Cattelain and Voeltzel, 2000; Voeltzel pers. comm. 18.03.2020; this is also true for further European findings of this kind located outside of the region considered here; cf. Patou-Mathis et al., 2005; Voeltzel, 2015).

REINDEER IN THE NEUWIED BASIN

The so far oldest remain of a reindeer found in the Central Rhineland – the basal fragment of a shed antler, most likely of a female – was excavated from a rather unexpected context, the late Middle Pleistocene interglacial sediments of the so-called Kärlich *Seeufer* site (Gaudzinski, 1998: 118-119; Gaudzinski et al., 1996: 326). At that time, reindeer generally were less adjusted to cold climate than to open landscapes, which were quite common during Central European Middle Pleistocene interglacials (cf. the presence of reindeer in the late Middle Pleistocene site of Vértesszöllös in Hungary; Kretzoi and Dobosi, 1990). In the

Fig. 22 Abri Stendel XVIII near Groß Schneen (Lower Saxony, northern Germany). Reindeer fragments exhibiting possible anthropogenic marks. – (Photo: K. Grote, Göttingen).

following period, reindeer remains hardly play any role in late Middle to Upper Pleistocene find horizons containing Middle Palaeolithic lithic and faunal assemblages excavated on the East Eifel volcanoes (Turner, 1995: 309-312). Contrarily, major assemblages of red deer antlers, mainly shed specimens, were uncovered in some of the crater fillings (Turner, 1995: 286-287), which have also been described as having been arisen from natural processes, but have not yet been explained conclusively (Conard, 1992: 97-105; Turner, 1995: 290; Street, 2002: 69; cf. Vollbrecht, 2000; Wenzel, 2007). Red deer were also mentioned for both of the Neuwied Basin Gravettian sites Rhens and Koblenz-Metternich, but – if the information available is correct – reindeer, again, were of no importance (Guenther and Musil, 1993).

The picture is, on the other hand, somewhat different at the famous Late Upper Palaeolithic Magdalenian sites of Andernach-Martinsberg and Gönnersdorf, although the presence of reindeer was nowhere near as significant as the presence of horses, which was the main prey in the regional Late Magdalenian. This mirrors a major difference to the Magdalenian in south-western Germany and adjacent regions, where reindeer were far more common, if not dominant in the excavated faunal assemblages (Maier, 2015: 73). The Gönnersdorf faunal record was described in depth by Martin and Elaine (Street and Turner, 2013). According to them, only seven individual reindeer could be reconstructed; most of the finds came to light in concentration I, mostly in the form of antler fragments/artefacts and teeth jewellery. Depending on their state of wear, three teeth of young reindeer indicate an age of death of around 20-24 months; this corresponds to the reconstructed time of occupation of concentration I (Street and Turner, 2013: 129, 249). Three skull fragments still have antlers attached, but no gender distinction has been discussed (Street and Turner, 2013: 121).

Some more information on the reindeer antlers from these sites is available in Johann Tinnes' PhD (Tinnes, 1994: 47). As far as can be seen, the processed antlers at both sites are mainly shed examples (Tinnes, 1994: 223). Tinnes notes that the antler rods from Andernach tend to be weaker than those of Gönnersdorf. The width/thickness ratio for both sites ranges from 2/2.5 cm to 4/4.5 cm. For Gönnersdorf Tinnes (1994: Pl. 2) was able to reconstruct a complete antler from several fragments. Bosinski (2007: 98-99) states that the Gönnersdorf concentration I antlers were shed examples from reindeer bulls, and the weaker *bois de massacre* represent female animals. On the other hand, he assigned the latter to sub-concentration IIa as "thick *bois de massacre* from male animals killed during autumn" (*schädelechte dicke Geweihstangen von im Herbst erlegten männlichen Tieren*). The most recent excavations in Andernach (1994-1996), which uncovered the Magdalenian concentration IV, revealed the fragment of a shed antler tentatively assigned to a female/subadult reindeer. The cranial fragment with preserved pedicle belonged to a reindeer without antlers; unfortunately, the sex of this individual could not be determined (Holzkämper, 2006: 148). Based on these finds, the season of occupation for concentration IV in Andernach has been assigned to the warmer half of the year (Holzkämper, 2006: 167).

Slightly contradictory, Martin and Elaine (Street and Turner, 2013: 249) proposed a "regional absence of prey" during summer and autumn for Gönnersdorf; people therefore must have hunted reindeer elsewhere. Due to the major amount of exogenous lithic raw materials (present at both Magdalenian sites), the hunting grounds regularly visited by these bands may have been located north of the upland range. Accordingly, it could be speculated that, beside lithic raw materials, people also transported male reindeer antler rods, mostly shed antlers, as raw material supplies to the Central Rhineland.

Even though the Neuwied Basin is part of the northern Rhenish upland ranges, there is little evidence of reindeer presence during the warm season of the year and none at all for spring hunting of migrating reindeer herds, although Gönnersdorf and probably Andernach were inhabited at that season. We can only speculate about the reasons for this: were there enough food supplies from regional horse hunting available? Or did reindeer in the broad Rhine valley as well as in the area of the Central Rhine (Neuwied) Basin behave differently than further west and east in the upland ranges? Could the Lower Rhine Embayment

(as a southern extension of the North European Plain) have influenced reindeer behaviour in any way? Ultimately, with the Magdalena Cave in the West Eifel and Oetrange in Luxembourg, two sites with numerous shed antlers of female/subadult reindeer are located even further south – and thus significantly deeper within the northern upland ranges – than the Neuwied Basin is.

In this context, it would be interesting to examine seasonal indicators from the Palaeolithic layers of the Lahn valley caves, located less than 50 km to the east of the Newied Basin. In the Lahn valley caves the presence of reindeer has been recorded from the Aurignacian until the Magdalenian. Among the material, shed antlers and skeletal elements of young animals are present (Terberger, 1993: 80-81, 114, 140). Or did the Late Magdalenian hunters in the Neuwied Basin simply miss or ignore the migrating herds because hunting horses in the surroundings was sufficient? We'll most probably never know.

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