

Unicorn “holotype” skeleton from the Late Pleistocene spotted hyena den site Sewecken-Berge (Germany)

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Abstract

Late Pleistocene Ice Age spotted hyena remains are described from the “Unicorn holotype skeleton” gypsum karst site Quedlinburg-Sewecken-Berge, Germany (Central Europe). The hyena population consists of adolescent to late adult individuals (96% of hyena NISP; 15% of megafauna NISP) indicating a commuting den site type. The comparisons to other European bone assemblages support hunting specialization on woolly rhinoceros (19% of NISP) and horses (27% of NISP). Specialization on bovids (*Bison/Bos*) can be added for this site. The megafauna contain few Eemian warm period remains of a large horse *Equus ferus fossilis*. Most (95%) of the megafauna is attributed to the Late Pleistocene glacial (Weichselian/Wuermian). Horse bones are dominated by distal leg elements from the smaller Przewalski horses *Equus ferus przewalskii* (26% of NISP). The Unicorn “holotype” skeleton originates from a composed horse skull, vertebrae and front legs, whereas the elephant remains added to this biologically not valid species must have been a straight-tusked elephant tusk.

KEYWORDS

1714 “holotype” skeleton, carnivore hyena prey bone assemblage, Europe, hyena commuting den type, Late Pleistocene, *Unicornu fossile* Valentini

1 | INTRODUCTION

The “Unicorn” is for sure the most famous fairy tale animal in the world, but the skeleton origin and exact reconstructions were not solved in several former publications, which compiled the controversial historical literature solely (e.g. Beer, 1977; Brauckmann & Gröning, 2011; Gotfredsen, 1999; Green, 2008; Lavers, 2009). Incorrect casts were finally produced more recently for two German Natural History Museums in Magdeburg and Osnabrück (e.g. Rust, 2002).

The Unicorn “skeleton” was found in 1663 north of the Harz Mountain, on the top of the Sewecken-Berge near Quedlinburg (central Europe, Figure 1a) by “quarry workers” (cf. Guericke, 1672). On the top of the hill, the mediaeval castle ruin of the Seweckenburg is present in elevation of 750 m a.s.l., including foundation of a younger aged 14th-century tower and surrounding fortification walls and

ditches, but the northern part was destroyed by quarry activities (Stolberg, 1983, Figure 1b). Those mining's activities of several smaller pits on the top of the hill (Figure 1c) were focussed on the Lower to Middle Muschelkalk Triassic limestones and gypsum since mediaeval times.

The historical mayor of Magdeburg, Otto von Guericke, was in the first one in the region allowed to observe the material. In his report, he identified a skeleton remain of a “Unicorn” (cf. history of Unicorn in Abel, 1939), which had a “five ellen” (=2.35 m) long slightly curved “horn” (Guericke, 1672). He also mentioned that the skeleton was improperly removed and as a result had been partly damaged due to lack of knowledge. After his report, there was a “skull, horn, some ribs, a vertebral column and legs found” which was given to the Cloister Quedlinburg being lost along with possibly the “horn” (=tusk) such as some other bones. In 1701, another “horn” was reported to have

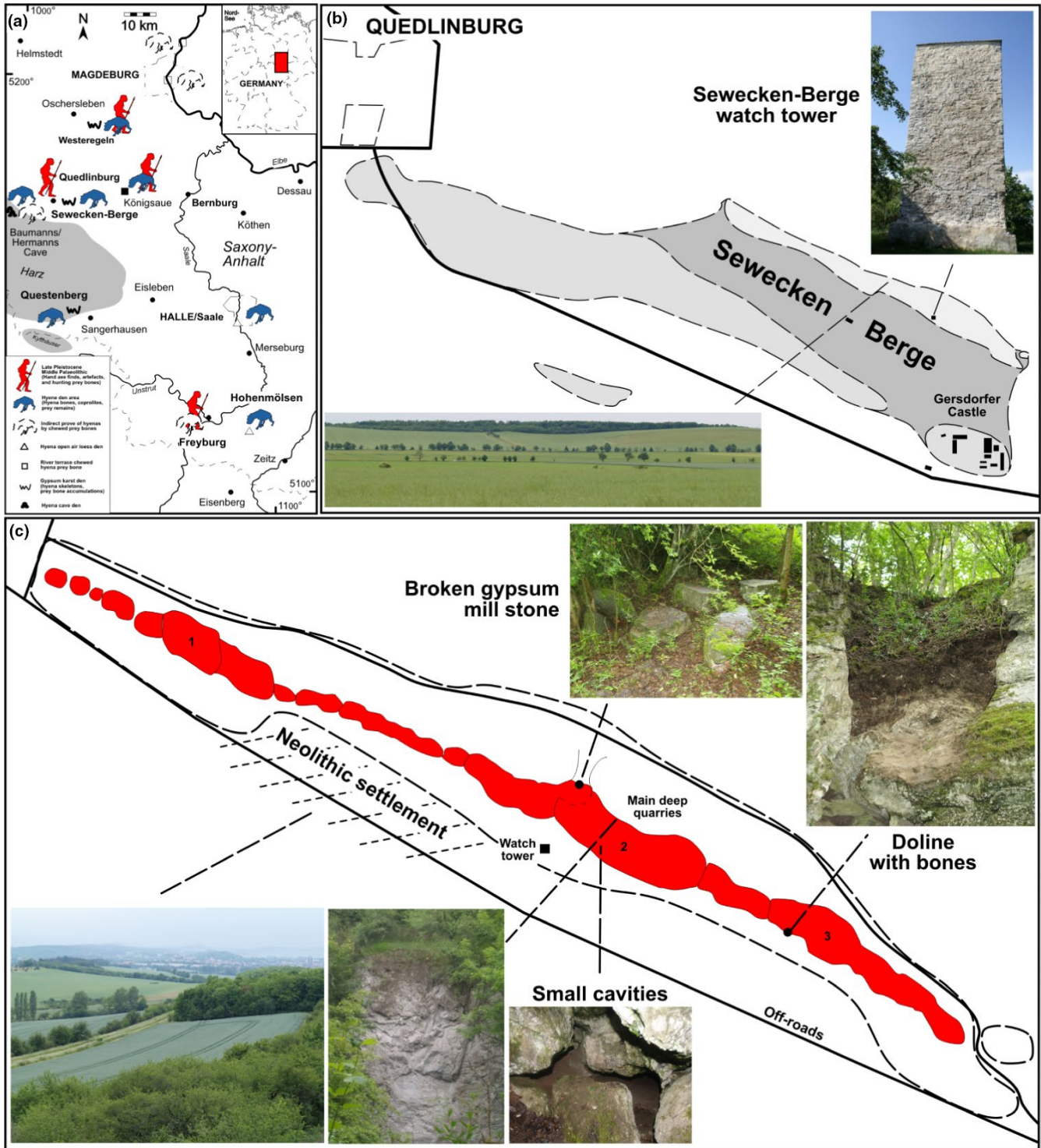


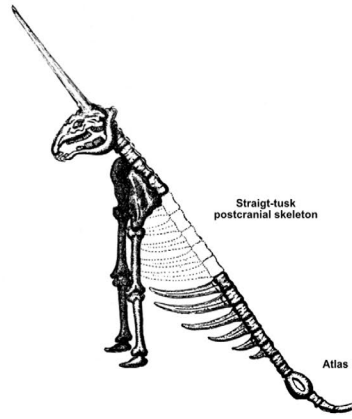
FIGURE 1 (a) Late Pleistocene Ice Age spotted hyena den sites in Central Germany (hyena den sites after Diedrich, 2012a; Neanderthal sites after Weber, 2004), (b) The hyena den site area on the top of the northern Lower/Middle Muschelkalk (Middle Triassic) chain of the Quedlinburg-Sewecken-Berge. (c) Historical and herein restudied and still open quarries and historically excavated doline

FIGURE 2 Quedlinburger Unicorn comparison of reconstructions from: (a) Valentini, 1714, (b) Leibniz 1749, (c) Rust, 2002, (and (d) new interpretation). The “Unicorn” seem to have been a composed from (e,f) two different Eemian interglacial Ice Age megamammals such as the straight-tusked elephant *Palaeoloxodon antiquus* (“horn” = tusk), and the horses *Equus ferus fossilis/przewalskii* (skull, front legs, anterior vertebral column and sternal bones), which explains the “horse-like” Unicorn reconstruction. (g) *Unicornus fossilis* illustration as a horse-like animal with narwhale horn (from Topsell, 1658 "Courtesy of Special Collections, University of Houston Libraries. UH Digital Library") and (h) new illustration based on the reconstruction of (by George “Rinaldino” Teichmann)

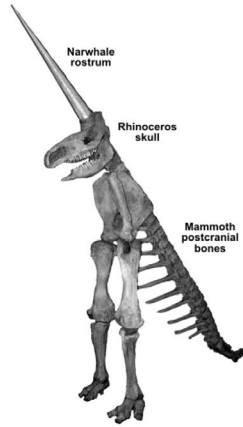
Quedlinburg unicorn interpretations



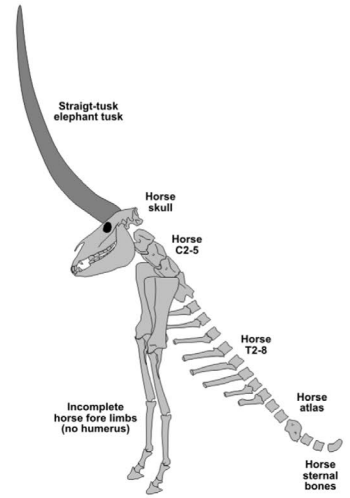
(a) Valentini 1714



(b) Leibnitz 1759



(c) Rust 2002

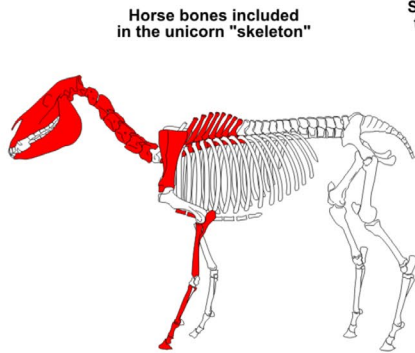


(d) New interpretation

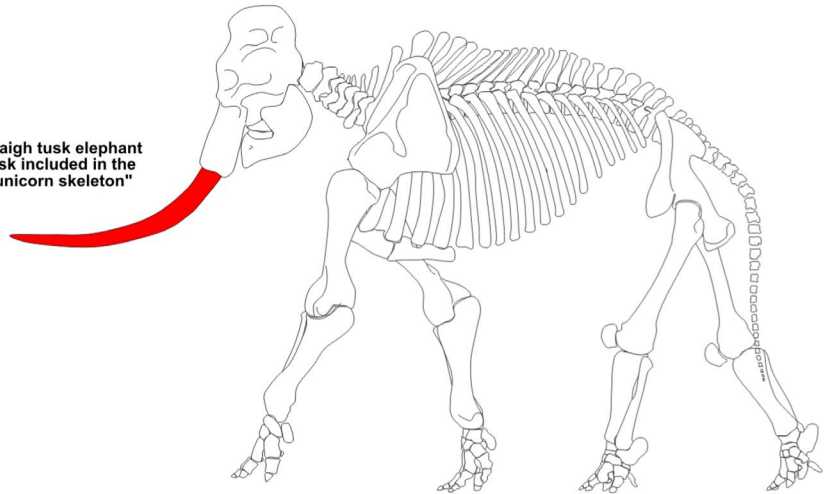


(e) Horse skull

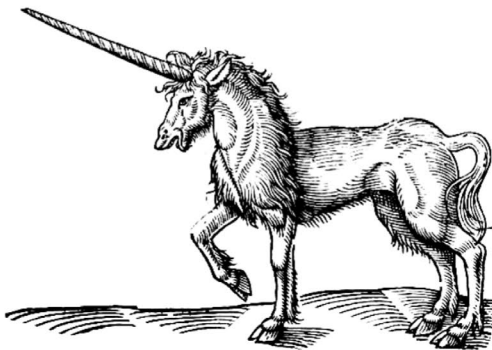
(f) Most probably used bones



Horse bones included in the unicorn "skeleton"



Straigh tusk elephant tusk included in the "unicorn skeleton"



(g) Topsell 1658



(h) Teichmann 2012

R₂

been found, also from a Unicorn (herein identified as fossil straight-tusked elephant tusk). The famous natural German scientist Gottfried Wilhelm Leibniz confirmed the determination by Otto von Guericke of a “Unicorn skeleton.” In his posthum printed publication, he discussed his thoughts about the “Unicorn” and added one illustration (Figure 2b), a reconstruction was presented of the “Unicorn holotype skeleton” (cf. Leibniz, 1749). Prior to that work, the first reconstruction of the “*Unicornu fossile*” was published by Valentini (1714); (Figure 2a) based on the material of Quedlinburg. The Unicorn was given a binominal zoological name as “*Unicornu fossile* Valentini, 1714.” The Unicorn skeleton is not a real “holotype” using the biological international nomenclature rules, because it does not represent a valid or existing species from the past, which will be demonstrated herein. After the original descriptions (Guericke, 1672) and second reconstruction drawing of the Unicorn by Leibniz (1759; Figure 2b), the Unicorn of Quedlinburg was interpreted as a “composite skeleton of different Ice Age animals” without further details or original material descriptions (cf. Oekentorp, 1994). It was illustrated and used in many ways as symbols worldwide as a “horse-like animal,” but a well-based study on the type locality bone material has never been made (e.g. Beer, 1977; Gotfredsen, 1999; Green, 2008; Lavers, 2009), nor has an detailed analyse been conducted of the osteology of the Unicorn skeleton figures. In the newest interpretation, it was rebuilt incorrectly based on mammoth postcranial bones and a woolly rhinoceros skull (cf. Rust, 2002; Figure 2c). A new illustration reconstruction included based on this cast exposed in the Naturkundemuseum Magdeburg, and a rhinoceros-like habitus proposed by Brauckmann and Gröning (2011) solely on historical literature will be revised herein.

Newer Unicorn locality area bone finds from the 19th century are labelled 1836 and are from the Krüger collection. The main existing material (over 500 bones) was collected or purchased from the quarry workers by Giebel between 1841 and 1844 (Giebel collections: Giebel, 1850a, 1850b, Giebel, 1851). The older collection part was the first paleontological collection of the Martin-Luther-University Halle/Saale (Department of Biological Sciences) and was used by Giebel in his dissertation for the descriptions of the “woolly rhinoceros” (Giebel, 1851). Some of his figured rhinoceros teeth have been rediscovered (Figures 10–11), whereas some of them are lost or not yet relocated in the large University collection, which has moved several times. His material was found 150 years later during new research of the “European Ice Age Spotted hyena project” together with the newly described similar important collection of Westeregeln (cf. Diedrich, 2012a). Giebel was already the first identifying the Sewecken-Berge bone assemblages to be of “hyena origin” including

mentioning “*Hyena spelaea*” remains, which were never figured in his work. Other fauna remains are mentioned by Nehring (1904), who excavated bones from one sinkhole at the Sewecken-Berge, which site is possibly relocated herein in quarry 3 (Figure 1c). He listed woolly rhinoceros (“*R. tichorhinus*” = *C. antiquitatis*), giant deer (“*C. giganteus*” = *M. giganteus*), reindeer (“*C. tarandus*” = *R. tarandus*) and “horse,” but also frog and at least five bird species. His material is partly preserved today in the MB and in part will not be relocated anymore.

2 | MATERIAL AND METHODS

2.1 | The site and new fieldwork

The Unicorn skeleton locality area east of Quedlinburg consists of several small and connected pit outcrops on the Sewecken-Berge hill and can be found under the Google Earth coordinates 51°46'13.82"N and 11°12'30.91"E (Figure 1a–c). Those old quarries were prospected in 2012 and still remain open. Those are connected in row and reach mostly few metres deep along the middle part of the mountain chain (Figure 2c). Only three are larger and deeper quarry parts (nos. 1–3). Whereas in the middle quarry (no. 2), some small caves are preserved without any fauna remains (Figure 1c), in quarry no. 3, a doline was rediscovered, in which in historical times bones must have been excavated. A prospection trench to clean the lower part of the section of the doline fill resulted in several already reworked bone fragments and reworked mixed sediments. The fragmented bone material obtained in 2012 represents remains of *Equus*, *Bos*/*Bison*, but it seems, Pleistocene and mediaeval material is mixed therein in reworked sediments. The doline was excavated partly in its lower part, but its sediments/stratigraphy was formerly destroyed. A full excavation of the doline was not performed under quite difficult outcrop situations, because it is obvious that the doline filling was removed and replaced by refilling. Possibly, it was the doline Nehring (1904) excavated and reported about. He described his site as elongated “Schlotte” which would fit in shape to this site. The collecting activities in 1903–1904 happened when the quarries were already in similar extension condition as today, because the mining stopped already before. In the upper part of the Middle Muschelkalk gypsum karst doline in quarry no. 3 (Figure 3e–f), a modern common fox den seems to have caused a mix with few modern and with mainly Pleistocene animal bones. Important are pieces of sediments (weathered limestones, grey marl and Marianglas gypsum crystals) which fit to the description of Nehring (1904) and to attached sediment of some bones in his

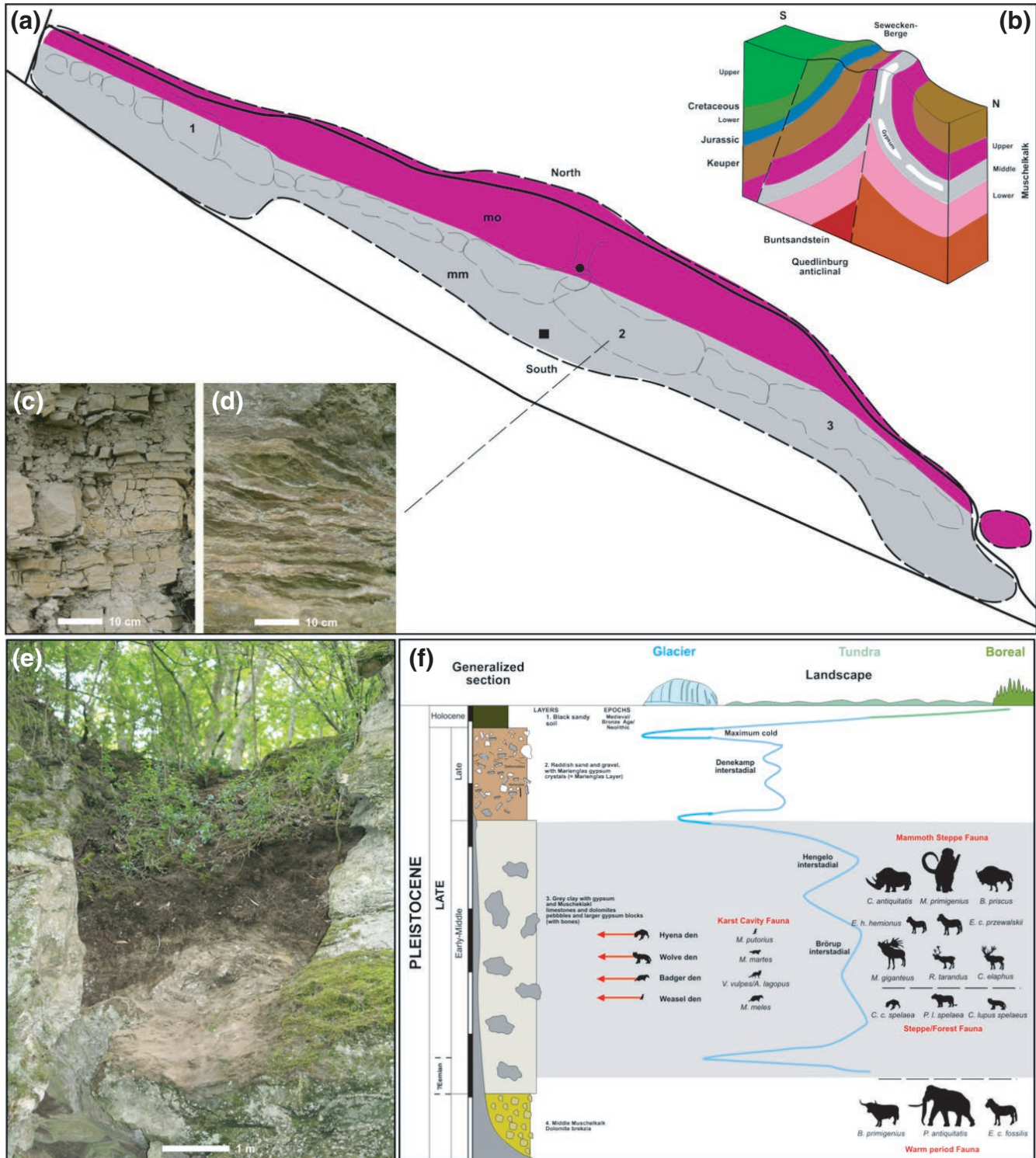


FIGURE 3 (a) Geological overview of the Quedlinburger anticlinal structure. (b) Cross section of the saddle structure simplified after Wagenbreth and Steiner (1990). (c) Decacentimetre bedded Middle Muschelkalk marlstone beds. (d) Thin-bedded Middle Muschelkalk gypsum layers. (e,f) Doline in quarry no. 3 (possibly excavated doline of Nehring, 1904) in which fragmentary and already historically reworked and smashed megafauna remains of *Equus* and *Bison/Bos* have been collected within this study

historical collection. Furthermore, this would support that this doline was the one he excavated in 1903/4. It is also the only one where during those new prospections in 2012 bone material had been found.

2.2 | Bone material

Two main collections Nehring and Giebel (cf. reports of Giebel (1850) and Nehring (1904) (including herein bone

TABLE 1 Bone list of *Crocotta crocuta spelaea* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Individual		Sex	Bite marks	Original	Old collection	Collection
				Left	Right					
1	2010. Sew-11	Cranium	Brain case			Adult to Late adult		x	Giebel 1841	MLU. IFG
2	2010. Sew-12	Cranium	Fragment, right premaxillary, maxillary with C-P4, P3 width = 24 mm, and jugal arch	x		High adult		x	Giebel 1841	MLU. IFG
3	2010. Sew-13	Cranium	Fragment, left maxillary with P3-4, P3 width = 22 mm, P4 width = 39 mm	x		High adult		x	Giebel 1841	MLU. IFG
4	2010. Sew-14	Cranium	Frontal fragment			Early adult		x	Giebel 1844	MLU. IFG
5	Ma.30362	Cranium	Strongly deformed, P4 (width 4.4 cm)			Early adult		x	Krüger 1836	Museum für Naturkunde Berlin
6	Ma.22905, 26904, 29608	Maxillary	With I ² /β, C, P ¹ /P ³	x		High adult		x	Krüger 1836	Museum für Naturkunde Berlin
7	Ma.29602	Maxillary	With P ^{3/4} (length 4.2 cm)	x		Adult		x	Krüger 1836	Museum für Naturkunde Berlin
8	Ma.29614, 29806	Maxillary	With P ^{2/4} , (length 4.1 cm)	x		High adult		x	Krüger 1836	Museum für Naturkunde Berlin
9	Ma.29601	Maxillary	With C, P ²	x		High adult		x	Krüger 1836	Museum für Naturkunde Berlin
10	Ma.29618	Maxillary	Fragment, with P ⁴ , width 4.3 cm	x		Late adult		x	Krüger 1836	Museum für Naturkunde Berlin
11	2010. Sew-21	Maxillary	Fragment with P2	x		Adult			Giebel 1844	MLU. IFG
12	Ma.29602	Mandible	With P2/3, M1 (width 3.1 cm)	x		Early adult		x	Krüger 1836	Museum für Naturkunde Berlin
13	Ma.29600	Mandible	Half, proximal, with P ₂	x		Adult		x	Krüger 1836	Museum für Naturkunde Berlin
14	Ma.29606	Mandible	Both parts, incomplete	x		High adult		x	Krüger 1836	Museum für Naturkunde Berlin
15	Ma.29599	Mandible	Fragment with M ₁ , (width 3.4 cm)	x		Adult		x	Krüger 1836	Museum für Naturkunde Berlin
16	2010. Sew-15	Mandible	Incomplete, with C, P2 and half P3	x		High adult		x	Giebel 1841	MLU. IFG

(Continues)

TABLE 1 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Original	Old collection	Collection
17	2010. Sew-16	Mandible	Incomplete, with P2-M1, P4 pathology, M1 width = 32 mm	x	x	High adult	Female		x	Giebel 1841	MLU. IFG
18	2010. Sew-17	Mandible	Incomplete, with P2-M1, M1 width = 33 mm	x		High adult	Female		x	Giebel 1841	MLU. IFG
19	2010. Sew-18	Mandible	Anterior half, with P2-3, half P4	x		High adult	Female		x	Giebel 1841	MLU. IFG
20	2010. Sew-19	Mandible	Anterior half, with I3, C, P2	x	x	Late adult			x	Giebel 1841	MLU. IFG
21	2010. Sew-20	Mandible	Ramus fragment		x					Giebel 1841	MLU. IFG
22	2010. Sew-22	Mandible	Fragment with M1, Width = 33 mm	x		Late adult			x	Giebel 1841	MLU. IFG
23	2010. Sew-23	Ceratohyal	Complete			Adult			x	Giebel 1841	MLU. IFG
24	2010. Sew-26	Tooth	C			High adult			x	Giebel 1841	MLU. IFG
25	2010. Sew-27	Tooth	C			High adult			x	Giebel 1841	MLU. IFG
26	Ma.29620	Tooth	C, (width 1.9 cm)			Adult	Female		x	Krüger 1836	Museum für Naturkunde Berlin
27	2010. Sew-31	Tooth	Upper jaw P2	x		Adult			x	Giebel 18,441	MLU. IFG
28	2010. Sew-24	Tooth	Upper jaw P3	x		High adult	Male		x	Giebel 1841	MLU. IFG
29	2010. Sew-25	Tooth	Upper jaw P3	x		High adult	Female		x	Giebel 1841	MLU. IFG
30	2010. Sew-30	Tooth	Upper jaw P4, fragment		x	Late adult				Giebel 18,441	MLU. IFG
31	Ma.29615	Tooth	Lower jaw M ₁ , (width 3.1 cm)		x	Adult	Male			Krüger 1836	Museum für Naturkunde Berlin
32	Ma.29612	Tooth	Upper jaw, P ³ , (width 2.5 cm)		x	High adult	Female			Krüger 1836	Museum für Naturkunde Berlin
33	2010. Sew-29	Tooth	Lower jaw, I3		x	High adult			x	Giebel 1844	MLU. IFG
34	Ma.29617	Tooth	Lower jaw, P3	x		Adult			x	Krüger 1836	Museum für Naturkunde Berlin
35	Ma.29611	Tooth	Lower jaw, P4 half	x		High adult				Krüger 1836	Museum für Naturkunde Berlin
36	Ma.29609	Tooth	Lower jaw, P3 half		x	Adult				Krüger 1836	Museum für Naturkunde Berlin
37	Ma.29619.1	Tooth	Upper jaw I ¹	x		Late adult				Krüger 1836	Museum für Naturkunde Berlin

(Continues)

TABLE 1 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Original	Old collection	Collection
38	Ma.29619.2	Tooth	Upper jaw I ¹	x	x	Late adult			Krüger 1836	Krüger 1836	Museum für Naturkunde Berlin
39	Ma.29619.3	Tooth	Upper jaw I ²	x		High adult			Krüger 1836	Krüger 1836	Museum für Naturkunde Berlin
40	Ma.29619.4	Tooth	Upper jaw I ²	x	x	High adult			Krüger 1836	Krüger 1836	Museum für Naturkunde Berlin
41	Ma.29619.5	Tooth	Lower jaw I ₃	x		Adult		x	Krüger 1836	Krüger 1836	Museum für Naturkunde Berlin
42	Ma.29619.6	Tooth	Lower jaw I ₃	x		Juvenile			Krüger 1836	Krüger 1836	Museum für Naturkunde Berlin
43	2010. Sew-28	Tooth	Lower jaw M1, half	x	x	High adult			Giebel 1841	Giebel 1841	MLU. IFG
44	2010. Sew-32	Scapula	Incomplete, distal parts missing	x		Adult to Late adult		x	Giebel 1841	Giebel 1841	MLU. IFG
45	Ma.29941	Humerus	Complete, Length 240 mm, distal width 6.1 cm	x	x	Adult to Late adult	Female		Giebel 1844	Giebel 1844	Museum für Naturkunde Berlin
46	Ma.29940	Humerus	Complete, distal width 5.8 cm	x	x	Adult to Late adult	Male		Giebel 1841	Giebel 1841	Museum für Naturkunde Berlin
47	Ma.29942	Humerus	Without distal joint	x		Adult		X	Giebel 1844	Giebel 1844	Museum für Naturkunde Berlin
48	2010. Sew-33	Humerus	Without distal joint		x	Adult to Late adult		x	Giebel 1841	Giebel 1841	MLU. IFG
49	2010. Sew-34	Humerus	Without proximal joint, distal width = 58 mm		x	Adult to Late adult	Female		Giebel 1841	Giebel 1841	MLU. IFG
50	2010. Sew-38	Ulna	Without distal part, maximal width = 50 mm	x		Adult to Late adult	Female	Distally cracked	Giebel 1841	Giebel 1841	MLU. IFG
51	2010. Sew-39	Ulna	Shaft, maximal width = 48 mm	x		Adult to Late adult	Male	At the proximal part	Giebel 1841	Giebel 1841	MLU. IFG
52	Ma.30359	Ulna	Complete, length 235 mm, smallest width 18 mm, largest width 49 mm	x		Adult to Late adult			Giebel 1844	Giebel 1844	Museum für Naturkunde Berlin
53	Ma.29936	Ulna	Without distal joint, Joint width 46 mm		x	Adult to Late adult			Giebel 1844	Giebel 1844	Museum für Naturkunde Berlin
54	2010. Sew-37	Radius	Distal half, Distal width = 46 mm	x		Adult to Late adult	Female		Giebel 1841	Giebel 1841	MLU. IFG

(Continues)

TABLE 1 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Original	Old collection	Collection
55	2010. Sew-36	Radius	Complete, Length = 227 mm Distal width = 44 mm	x		Adult to Late adult			x	Giebel 1841	MLU, IfG
56	2010. Sew-35	Radius	Complete, Length = 227 mm Distal width = 43 mm		x	Adult to Late adult			x	Giebel 1841	MLU, IfG
57	Ma.29939	Radius	Distal half, distal joint width 47 mm		x	Adult to Late adult	Female		X	Giebel 1844	Museum für Naturkunde Berlin
58	Ma.29937	Radius	Without distal joint	x		Adult to Late adult	Male		X	Giebel 1844	Museum für Naturkunde Berlin
59	Ma.30360	Radius	Complete, Length 210 mm, Distal width 43 m	x		Adult to Late adult			X	Giebel 1844	Museum für Naturkunde Berlin
60	2010. Sew-40	Scapholunatum	Complete, width = 40 mm	x		Adult to Late adult	Female		X	Giebel 1841	MLU, IfG
61	2010. Sew-41	Scapholunatum	Complete, width = 37 mm	x		Adult to Late adult	Male		X	Giebel 1841	MLU, IfG
62	2010. Sew-44	Pisiform	Complete		x	Adult to Late adult			X	Giebel 1841	MLU, IfG
63	2010. Sew-48	Metacarpus	III, length = 94 mm distal width = 15 mm	x		Adult to Late adult			X	Giebel 1841	MLU, IfG
64	2010. Sew-47	Metacarpus	IV, length = 83 mm distal width = 15 mm		x	Adult to Late adult			X	Giebel 1841	MLU, IfG
65	Ma. 29823a	Metacarpus	V, complete		x	Adult			x	Giebel 1844	Museum für Naturkunde Berlin
66	Ma. 29823b	Metacarpus	IV, complete	x		Adult			x	Giebel 1844	Museum für Naturkunde Berlin
67	2010. Sew-43b	Metacarpus	IV, pathology, length = 86 mm distal width = 17 mm	x		Adult to Late adult			X	Giebel 1841	MLU, IfG
68	2010. Sew-43a	Metacarpus	V, pathology, length = 69 mm distal width = 15 mm	x		Adult to Late adult			X	Giebel 1841	MLU, IfG
69	2010. Sew-46	Metacarpus	V, pathology, length = 70 mm distal width = 16 mm		x	Adult to Late adult			X	Giebel 1841	MLU, IfG

(Continues)

TABLE 1 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Original	Old collection	Collection
70	Ma.29820	Cervical vertebra	Atlas, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
71	2010. Sew-56	Cervical vertebra	Atlas, incomplete			Adult to Late adult			X	Giebel 1844	MLU. IfG
72	2010. Sew-57	Cervical vertebra	Atlas, incomplete			Adult to Late adult			X	Giebel 1844	MLU. IfG
73	2010. Sew-58	Cervical vertebra	Axes, incomplete			Early adult			X	Giebel 1844	MLU. IfG
74	Ma.2841	Cervical vertebra	Axes, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
75	Ma.28996	Cervical vertebra	C3, without discs			Juvenile			x	Giebel 1844	Museum für Naturkunde Berlin
76	2010. Sew-59	Cervical vertebra	C3, incomplete			Adult to Late adult			X	Giebel 1841	MLU. IfG
77	2010. Sew-60	Cervical vertebra	C4, incomplete			Adult to Late adult			X	Giebel 1841	MLU. IfG
78	2010. Sew-61	Cervical vertebra	C5, incomplete			Adult to Late adult			X	Giebel 1841	MLU. IfG
79	2010. Sew-62	Cervical vertebra	C6, incomplete			Adult to Late adult			X	Giebel 1841	MLU. IfG
80	2010. Sew-63	Cervical vertebra	C7, incomplete			Adult to Late adult			X	Giebel 1841	MLU. IfG
81	Ma.28997	Cervical vertebra	C7, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
82	2010. Sew-64	Thoracic vertebra	T1			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
83	2010. Sew-65	Thoracic vertebra	T3, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
84	2010. Sew-66	Thoracic vertebra	T4, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
85	2010. Sew-67	Thoracic vertebra	Middle, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
86	2010. Sew-68	Thoracic vertebra	Middle, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 1 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Original	Old collection	Collection
87	Ma.29821	Thoracic vertebra	No. 15			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
88	2010. Sew-69	Lumbar vertebra	Middle, without discs			Juvenile			X	Giebel 1841	MLU. IfG
89	2010. Sew-70	Lumbar vertebra	L3, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
90	2010. Sew-71	Lumbar vertebra	L5, incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
91	Ma.29834	Caudal vertebra	Middle			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
92	Ma.30357	Pelvic	Coxa	x		Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
93	2010. Sew-51	Femur	Without distal joint	x		Adult to Late adult	Male		x	Giebel 1841	MLU. IfG
94	2010. Sew-50	Femur	Complete, length = 261 mm, distal width = 56 mm		x	Adult to Late adult	Female		x	Giebel 1841	MLU. IfG
95	2010. Sew-52	Femur	Distal joint, width = 55 mm	x		Adult to Late adult	Female			Giebel 1841	MLU. IfG
96	Ma.29948	Femur	Complete, length = 278 mm, distal width = 56 mm		x	Adult to Late adult	Female		x	Giebel 1844	Museum für Naturkunde Berlin
97	Ma.29935	Femur	Femur, without proximal joint, distal width = 57 mm		x	Adult to Late adult	Male		x	Giebel 1844	Museum für Naturkunde Berlin
98	Ma.29947	Femur	Femur, shaft fragment				Female			Giebel 1844	Museum für Naturkunde Berlin
99	2010. Sew-53	Tibia	Shaft without joint discs		x	Juvenile			x	Giebel 1841	MLU. IfG
100	2010. Sew-54	Tibia	Complete, pathology, Length = 193 mm, distal width = 38 mm		x	Late adult			x	Giebel 1841	MLU. IfG
101	Ma.29945	Tibia	Complete, length = 200 mm, distal width = 41 mm		x	Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 1 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Original	Old collection	Collection
102	Ma.29946	Tibia	Nearly complete, length = 85 mm, distal width = 39 mm	x		Adult to Late adult	Male		x	Giebel 1844	Museum für Naturkunde Berlin
103	Ma.30361	Tibia	Nearly complete, pathological, length = 184 mm, distal width = 38 mm		x	Adult to Late adult	Male		x	Giebel 1844	Museum für Naturkunde Berlin
104	Ma.29944	Tibia	Nearly complete, length = 191 mm, distal width = 40 mm	x		Adult to Late adult	Female		x	Giebel 1844	Museum für Naturkunde Berlin
105	Ma.29943	Tibia	Nearly complete, pathological, length = 201 mm, distal width = 43 mm	x		Adult to Late adult	Female		x	Giebel 1844	Museum für Naturkunde Berlin
106	2010. Sew-55	Astragal	Complete, width = 35 mm, Length = 38 mm	x		Adult to Late adult			x	Giebel 1841	MLU, IFG
107	Ma.29836	Calcaneus	Complete	x		Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
108	2010. Sew-45	Intermedium	Complete	x		Adult to Late adult			x	Giebel 1841	MLU, IFG
109	2010. Sew-49	Metatarsus	III, length = 78 mm, distal width = 15 mm	x		Adult to Late adult			x	Giebel 1841	MLU, IFG
110	Ma.29822	Metatarsus	V		x	Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
111	2010. Sew-42	Phalanx 1	Complete			Adult to Late adult			X	Giebel 1841	MLU, IFG
112	Ma.29831	Phalanx 1	Complete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
113	Ma.29832	Phalanx 1	Complete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
114	Ma.29616.1	Phalanx 3	Incomplete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin
115	Ma.29616.2	Phalanx 3	Complete			Adult to Late adult			x	Giebel 1844	Museum für Naturkunde Berlin

TABLE 2 *Mammuthus primigenius* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	left	right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-180	Skull	Fragment with two molars M ¹	x	x	Early juvenile		Giebel 1841	MLU. IFG
2	Ma.14840	Tooth	Upper jaw M ¹		x	Early Juvenile		Giebel 1844	Museum für Naturkunde Berlin
3	Ma.14839	Tooth	Half lower jaw 3	x		Early adult		Krüger 1836	Museum für Naturkunde Berlin
4	Ma.14836	Tooth	Upper jaw M ²		x	Early adult		Krüger 1836	Museum für Naturkunde Berlin
5	Quedl-Sew-2	Tooth	Lower jaw M ₂	x		Early adult			Museum Quedlinburg
6	2010. Sew-174	Mandible	Fragment with tooth			Early Juvenile		Giebel 1841	MLU. IFG
7	2010. Sew-175	Fibula	Shaft			Early Juvenile		Giebel 1841	MLU. IFG
8	Ma.17089	Navicular	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
9	Ma.17091	Tarsale II	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
10	Ma.17085	Metatarsus	Without distal joint			Early Juvenile		Giebel 1841	Goldfussmuseum Bonn
11	Ma.17086	Metatarsus	Without distal joint			Early Juvenile		Giebel 1844	Museum für Naturkunde Berlin
12	Ma.17087	Metatarsus	Half			Early Juvenile		Giebel 1844	Museum für Naturkunde Berlin
13	2010. Sew-176	Pelvis	Coxa, incomplete	x		Early Juvenile	x	Giebel 1841	MLU. IFG
14	2010. Sew-177	Pelvis	Fragment		x	Early Juvenile		Giebel 1841	MLU. IFG
15	2010. Sew-178	Pelvis	Fragment		x	Early Juvenile		Giebel 1841	MLU. IFG
16	2010. Sew-179	Pelvis	Fragment		x	Early Juvenile		Giebel 1841	MLU. IFG

catalogue monograph, see Tables 1-19 and Figures 4-19) survived and forgotten during the two world wars in different German collections including the Preußische Geologische Landesanstalt in Berlin, or the Martin-Luther-University Halle/Saale, such as few remains which were rediscovered in the Cloister Museum in Quedlinburg. This material is presented osteologically for the first time herein whereas most bones are figured for a long-term detail documentation. Furthermore, the site was studied interdisciplinary in its geology and palaeontology. In total, 775 megafauna remains in form of some incomplete and mainly fragmented skulls, teeth and postcranial bones are housed in different collections.

2.2.1 | Abbreviations

The historically oldest collected bone material is from the Museum Quedlinburg (=MQ), where sadly the “Unicorn composite skeleton” was lost. At least some single bones, teeth and jaws are still present there in the collection including horse bones, which even might have belonged to the “holotype skeleton.” A more recent replica of the Unicorn was made by other bones from other sites (Figure 2c) by the Naturkundemuseum Magdeburg (=NMM), which was compared and analysed critically. There, additionally a few newer excavated bones from the site are in the collection. A single woolly rhinoceros jaw is housed in the Goldfuss museum Bonn (=GMB). The largest bone collection of Quedlinburg-Sewecken-Berge (coll. Giebel labelled 1841) is from the Martin-Luther-University Halle/Saale Institut für Geologie (=MLU.IFG) and was cleaned, prepared and inventoried within this study (collection no. 2010. Sew-1 to 520). Even some mislabelled bones were possible to correct in their site origin after a new bone collection management by the author of three larger bone localities (Freyburg open-air loess, Westeregeln gypsum karst dolines and Quedlinburg gypsum karst dolines). The bone preservation at both gypsum karst sites Westeregeln and Quedlinburg is different, especially in bone colour, and sediment or gypsum crystals being attached also result in different gypsum originating rock types Permian Zechstein dolomite and Triassic Muschelkalk limestone. Another and second large collection from Giebel labelled in 1844 is housed in the Museum of the Humboldt University, Berlin (=MB). In this institution, another third smaller collection of Krüger has the oldest known label dates of 1836.

2.3 | Geology and karst sedimentology

The Sewecken-Berge hill is a result of the Harz Mountain geotectonics and part of the Quedlinburger anticline (Wagenbreth & Steiner, 1990; Figure 3a,b). The rocks in

TABLE 3 *Coelodonta antiqitatis* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-127	Skull	Frontal			Adult to Late adult		Giebel 1841	MLU. IfG
2	2010. Sew-171	Maxillary	With dm ²⁻⁴	x		Early juvenile		Giebel 1841 (Original Giebel, 1851)	MLU. IfG
3	2010. Sew-173	Maxillary	With dm ²⁻⁴		x	Early juvenile		Giebel 1841	MLU. IfG
4	2010. Sew-162	Maxillary	M ¹⁻³	x		Late juvenile		Giebel 1841	MLU. IfG
5	Ma.25961, 25,962	Maxillary	Maxillary teeth, P ²⁻⁴ right, P ²⁻³ left	x	x	Adult		1889	Museum für Naturkunde Berlin
6	2010. Sew-150, 167, 169	Maxillary dentition	P ²⁻³ , M ¹⁻²		x	Late adult		Giebel 1841 (Original Giebel, 1851, one tooth missing)	MLU. IfG
7	Ma.25837	Tooth	dm ³			Juvenile		Giebel 1844	Museum für Naturkunde Berlin
8	Ma.25836	Tooth	dm ³			Juvenile		Giebel 1844	Museum für Naturkunde Berlin
9	2010. Sew-172	Tooth	dm ²			Early juvenile		Giebel 1841	MLU. IfG
10	Ma.25843	Tooth	dm ⁴			Juvenile		Giebel 1844	Museum für Naturkunde Berlin
11	Ma.25951a	Tooth	P ²		x	Late adult		Giebel 1844	Museum für Naturkunde Berlin
12	2010. Sew-170	Tooth	P ²		x	Late adult		Giebel 1841 (Original Giebel, 1851)	MLU. IfG
15	2010. Sew-160	Tooth	P ²⁻³	x		Adult		Giebel 1841	MLU. IfG
16	2010. Sew-161	Tooth	P ²⁻³	x		Adult		Giebel 1841	MLU. IfG
17	Ma.25951b	Tooth	P ³	x		Late adult		Giebel 1844	Museum für Naturkunde Berlin
18	2010. Sew-163	Tooth	P ³		x	Adult		Giebel 1841	MLU. IfG
19	2010. Sew-164	Tooth	P ³	x		Early adult		Giebel 1841	MLU. IfG
20	2010. Sew-165	Tooth	P ³	x		Adult		Giebel 1841	MLU. IfG
21	2010. Sew-166	Tooth	P ³		x	Adult		Giebel 1841 (Original Giebel, 1851)	MLU. IfG
22	2010. Sew-168	Tooth	P ⁴ , incomplete	x		Late adult		Giebel 1841	MLU. IfG
23	2010. Sew-159	Tooth	P ⁴	x		Adult		Giebel 1841	MLU. IfG
24	2010. Sew-157	Tooth	M ¹		x	High adult		Giebel 1841	MLU. IfG

(Continues)

TABLE 3 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
25	2010. Sew-156	Tooth	M ¹		x	Late adult		Giebel 1841	MLU, IfG
26	2010. Sew-149	Tooth	M ¹⁻²		x	High adult		Giebel 1841	MLU, IfG
27	2010. Sew-151	Tooth	M ²		x	Adult		Giebel 1841	MLU, IfG
28	2010. Sew-152	Tooth	M ²		x	Adult		Giebel 1841	MLU, IfG
29	2010. Sew-153	Tooth	M ²		x	Adult		Giebel 1841	MLU, IfG
30	2010. Sew-154	Tooth	M ²		x	Adult		Giebel 1841	MLU, IfG
31	2010. Sew-155	Tooth	M ²		x	Adult		Giebel 1841	MLU, IfG
32	2010. Sew-158	Tooth	M ² , incomplete	x		High adult		Giebel 1841	MLU, IfG
33	Quedl-Sew-3	Mandible	Incomplete			High adult			Museum Quedlinburg
34	Ma.855.2-8	Lower jaw dentition	Right P ₃ -M ₂ right, P ₄ -M ₂ left	x	x	Late juvenile		Giebel 1844	Museum für Naturkunde Berlin
35	2010. Sew-132	Lower jaw	With dm ₁	x		Juvenile		Giebel 1841	MLU, IfG
36	2010. Sew-133	Lower jaw	With dm ₂₋₃	x		Juvenile		Giebel 1841	MLU, IfG
37	2010. Sew-134	Lower jaw	With dm ₂₋₄		x	Juvenile		Giebel 1841	MLU, IfG
38	2010. Sew-137	Lower jaw	With dm ₂	x		Juvenile		Giebel 1844	MLU, IfG
39	M1739	Lower jaw	Milk teeth dentition			Juvenile		Giebel 1844	Goldfussmuseum Bonn
40	2010. Sew-129	Lower jaw	with P ₃₋₄ , M ₁₋₃		x	Early adult		Giebel 1844	MLU, IfG
41	2010. Sew-130	Lower jaw	with P ₃₋₄ , M ₁	x		High adult		Giebel 1844	MLU, IfG
42	2010. Sew-131	Lower jaw	with P ₃₋₄ , M ₁		x	High adult		Giebel 1844	MLU, IfG
43	2010. Sew-135	Tooth	P ₂			Early adult		Giebel 1844	MLU, IfG
44	2010. Sew-136	Tooth	P ₂			Adult		Giebel 1844	MLU, IfG
45	2010. Sew-137	Tooth	P ₃	x		Early adult		Giebel 1844	MLU, IfG
46	2010. Sew-138	Tooth	P ₃	x		Early adult		Giebel 1844	MLU, IfG
47	2010. Sew-139	Tooth	P ₃	x		Adult		Giebel 1844	MLU, IfG
48	2010. Sew-140	Tooth	P ₃		x	High adult		Giebel 1844	MLU, IfG
49	2010. Sew-141	Tooth	P ₄	x		High adult		Giebel 1844	MLU, IfG
50	2010. Sew-142	Tooth	P ₄		x	Early adult		Giebel 1844	MLU, IfG
51	2010. Sew-146	Tooth	M ₁		x	Early adult		Giebel 1844	MLU, IfG
52	2010. Sew-147	Tooth	M ₁ , Fragment		x	Early adult		Giebel 1844	MLU, IfG

(Continues)

TABLE 3 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
53	2010. Sew-143	Tooth	M ₃		x	Adult		Giebel 1844	MLU, IfG
54	2010. Sew-144	Tooth	M ₃		x	Early adult		Giebel 1844	MLU, IfG
55	2010. Sew-145	Tooth	M ₃	x		Early adult		Giebel 1844	MLU, IfG
56	2010. Sew-148	Tooth	Fragments					Giebel 1844	MLU, IfG
57	2010. Sew-84	Humerus	Incomplete		x	Adult to Late adult		Giebel 1844	MLU, IfG
58	Ma.24975	Ulna	Incomplete, without distal parts		x	Early adult		Giebel 1844	Museum für Naturkunde Berlin
59	Ma.25587	Ulna	Incomplete, modern damaged		x	Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
60	2010. Sew-123	Ulna	Incomplete		x	Adult to Late adult		Giebel 1844	MLU, IfG
61	2010. Sew-124	Ulna	Incomplete		x	Adult to Late adult		Giebel 1844	MLU, IfG
62	Ma.24761	Radius	Incomplete, modern damaged	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
63	Ma.24704	Radius	Incomplete, proximal half	x		Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
64	2010. Sew-120	Radius	Incomplete		x	Adult to Late adult		Giebel 1844	MLU, IfG
65	2010. Sew-121	Radius	Complete	x		Adult to Late adult	x	Giebel 1844	MLU, IfG
66	2010. Sew-122	Radius	Complete		x	Adult to Late adult		Giebel 1844	MLU, IfG
67	Ma.25729	Carpale 3	Incomplete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
68	Ma.25724	Carpale 3	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
69	Ma.25723	Carpale 4 and 5 (Hamatum)	Complete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
70	2010. Sew-110	Carpale 4 and 5 (Hamatum)	Complete		x	Adult to Late adult		Giebel 1844	MLU, IfG
71	Ma.25722	Radial	Complete		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
72	2010. Sew-111	Ulnare	Complete	x		Adult to Late adult		Giebel 1844	MLU, IfG
73	Ma.7330	Cuneiform III	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
74	2010. Sew-112	Intermedium	Complete	x		Adult to Late adult		Giebel 1844	MLU, IfG
75	2010. Sew-113	Intermedium	Incomplete		x	Adult to Late adult		Giebel 1844	MLU, IfG

(Continues)

TABLE 3 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
76	2010. Sew-75	Metacarpus II	Complete	x		Adult to Late adult		Giebel 1844	MLU, IFG
77	Ma.25604	Metacarpus II	Complete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
78	Ma.1753	Metacarpus II	Complete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
79	Ma.25603	Metacarpus II	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
80	2010. Sew-76	Metacarpus III	Complete		x	Adult to Late adult		Giebel 1844	MLU, IFG
81	Ma.25605	Metacarpus IV	Complete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
82	Ma.1752	Metacarpus IV	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
83	Ma.25675	Phalanx I	Metacarpus, digit III			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
84	Ma.24881	Cervical vertebra	Atlas, incomplete			Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
85	Ma.24880	Cervical vertebra	Atlas, incomplete			Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
86	2010. Sew-114	Cervical vertebra	Atlas, incomplete			Adult to Late adult	x	Giebel 1844	MLU, IFG
87	2010. Sew-115	Cervical vertebra	Axes, incomplete			Adult to Late adult	x	Giebel 1844	MLU, IFG
88	2010. Sew-116	Cervical vertebra	C. middle, incomplete			Adult to Late adult		Giebel 1844	MLU, IFG
89	Ma.24924	Thoracic vertebra	T1, incomplete			Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
90	Ma.24923	Thoracic vertebra	T2, incomplete			Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
91	2010. Sew-117	Thoracic vertebra	T3, incomplete			Adult to Late adult	x	Giebel 1844	MLU, IFG
92	2010. Sew-118	Thoracic vertebra	Middle, incomplete			Adult to Late adult	x	Giebel 1844	MLU, IFG
93	Ma.24925	Thoracic vertebra	Middle, incomplete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
94	Ma.25696	Costa	Anterior, upper part	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
95	Ma.17097	Sternal bone	Complete					Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 3 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
96	2010. Sew-74	Sacrum	Incomplete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
97	2010. Sew-128	Pelvis	Acetabulum	x		Adult to Late adult		Giebel 1844	MLU, IfG
98	Ma.25551	Femur	Shaft		x	Early adult		Giebel 1844	Museum für Naturkunde Berlin
99	Quedl-Sew-4	Femur	Shaft	x		Juvenile	x		Museum Quedlinburg
100	Ma.25701	Patella	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
101	Ma.25700	Patella	Nearly complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
102	Quedl-Sew-5	Tibia	Shaft	x		Juvenile	x		Museum Quedlinburg
103	Ma.25553	Tibia	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
104	Ma.25552	Tibia	Without proximal joint	x		Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
105	2010. Sew-77	Tibia	Complete	x		Adult to Late adult		Giebel 1844	MLU, IfG
106	2010. Sew-73	Tibia	Proximal fragment		x	Adult to Late adult		Giebel 1844	MLU, IfG
107	2010. Sew-85	Fibula	Complete		x	Adult to Late adult		Giebel 1844	MLU, IfG
108	2010. Sew-86	Fibula	Incomplete, distal ends	x		Adult to Late adult		Giebel 1844	MLU, IfG
109	Ma.25726	Intermedium	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
110	Ma.25725	Naviculare	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
111	Ma.25728	Cuboid	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
112	Ma.25727	Cuboid	Incomplete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
113	Quedl-Sew-7	Calcaneus	Nearly complete, chewed			Adult to Late adult	x		Museum Quedlinburg

(Continues)

TABLE 3 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
114	Ma.25577	Calcaneus	Nearly complete	x		Early adult	x	Giebel 1844	Museum für Naturkunde Berlin
115	2010. Sew-72	Calcaneus	Nearly complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
116	2010. Sew-125	Calcaneus	Complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
117	2010. Sew-126	Calcaneus	Complete		x	Adult to Late adult		Giebel 1844	MLU. IfG
118	2010. Sew-83	Calcaneus	Complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
119	2010. Sew-79	Astragalus	Incomplete	x		Adult to Late adult		Giebel 1844	MLU. IfG
120	2010. Sew-80	Astragalus	Complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
121	2010. Sew-82	Astragalus	Complete			Adult to Late adult		Giebel 1844	MLU. IfG
122	2010. Sew-81	Metatarsus	II, complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
123	Qued-Sew-6	Metatarsus	II, complete	x		Juvenile			Museum Quedlinburg
124	2010. Sew-135	Metatarsus	III, complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
125	2010. Sew-136	Metatarsus	III, incomplete		x	Adult to Late adult		Giebel 1844	MLU. IfG
126	Ma.25633	Metatarsus	IV, complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
127	2010. Sew-106	Metatarsus	IV, complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
128	Ma.25630	Metatarsus	IV, complete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
129	Ma.25632	Metatarsus	IV, complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
130	Ma.25631	Metatarsus	IV, without distal joint	x		Early adult		Giebel 1844	Museum für Naturkunde Berlin
131	2010. Sew-107	Cuneiform III	Complete		x	Adult to Late adult		Giebel 1844	MLU. IfG
132	2010. Sew-108	Cuneiform III	Complete	x		Adult to Late adult		Giebel 1844	MLU. IfG
133	Ma.25676	Phalanx I	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
134	2010. Sew-97	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IfG
135	2010. Sew-98	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IfG
136	2010. Sew-99	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IfG
137	2010. Sew-100	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IfG
138	2010. Sew-101	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IfG

(Continues)

TABLE 3 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
139	2010. Sew-102	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IFG
140	2010. Sew-103	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IFG
141	2010. Sew-104	Phalanx II	Complete			Adult to Late adult		Giebel 1844	MLU. IFG
141	Ma.25674	Phalanx III	Incomplete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
143	2010. Sew-93	Phalanx III	Complete			Adult to Late adult		Giebel 1844	MLU. IFG
144	2010. Sew-94	Phalanx III	Complete			Adult to Late adult		Giebel 1844	MLU. IFG
145	2010. Sew-95	Phalanx III	Incomplete			Adult to Late adult		Giebel 1844	MLU. IFG
146	2010. Sew-96	Phalanx III	Complete			Adult to Late adult		Giebel 1844	MLU. IFG
147	2010. Sew-109	Indet. carpale/tarsale	Complete			Adult to Late adult		Giebel 1844	MLU. IFG

which the karst cavities formed are gypsum karst depressions in the Middle Muschelkalk gypsum (Weissermehl, 1926). South of this Muschelkalk chain, a Lower Cretaceous chain built the second saddle structure (Figure 3b).

The larger Quedlinburg doline fills, for example opposite the above-mentioned “Schlotte” in quarry no. 3, have different sediment fills with weathered Middle Muschelkalk marlstone rock breccia. Here, only a generalized and first section can be presented for the bone-bearing doline in quarry 3, which does not allow more details in its dating. In all those doline pockets, and along the quarry walls, the uppermost layers are cut, and those consist of brown-reddish sands, in which Marianglas is common such as surrounding rock fragments (Figure 3f). The historically collected material must come from deeper parts of some smaller dolines, and therein from below the “Marianglas-sand layer” (Figure 3f, layer 3). A similar developed reddish, sandy layer is also present at the hyena den gypsum karst site Westeregeln (layer 4, see Diedrich, 2013b). There, it is dated into the Late Pleistocene. A correlation cannot be made simply to there, but the fauna from Sewecken-Berge was found below in the grey and gypsum-block-rich layer (layer 2, Figure 3), which must be of early to middle Late Pleistocene in age, also dated by the megafauna composition presented later. Some of the Quedlinburg megafauna seem to come already from an Eemian interglacial layer, but most megafauna remains are from the early–middle Weichselian/Wuermian glacial period. This dating is also observed by micromammals (Heinrich, 2003).

Very obviously, the bones of the historical collection must have been found in different layers/dolines, because those have two main and different colours. Most material is reddish (limonite impregnation), and those bones have Marianglas sometimes attached to, or in their shafts. The fauna seems to relate only (or mainly) to a cold period fauna. Yellowish-greenish bones seem to relate to another layer (or different doline) whereas to this material the large horses *E. c. fossilis* and some *B. primigenius* remains belong to. Possibly, those are from a warm period layer.

2.4 | Palaeontology

2.4.1 | The hyena population remains

The main carnivore remains are from hyenas, which material is spread over the two collections of the MLU.IFG and the MB (Table 1). A single coprolite is preserved and exhibited in the MQ (Figure 4.1). One skull from a cub is more or less complete, but strongly deformed diagenetically (Figure 4.2). The already permanent dentition is incompletely present, but the preserved premolar teeth are unworn and have few developed roots. Additionally, the cranial sutures are non-fused (except braincase), which indicate an older juvenile individual age in fully changed milk dentition. To this skull, in

TABLE 4 *Bison priscus/Bos primigenius* cranial remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Old collection	Collection
1	2010. Sew-494	Tooth	dm ³	x		Early juvenile			Giebel 1841	MLU. IfG
2	2010. Sew-493	Tooth	dm ³	x		Early juvenile			Giebel 1841	MLU. IfG
3	2010. Sew-479	Tooth	Dentition P ⁴ -M ³			Early adult			Giebel 1841	MLU. IfG
4	2010. Sew-489	Tooth	P ²	x		High adult			Giebel 1841	MLU. IfG
5	2010. Sew-492	Tooth	P ²	x		Early adult			Giebel 1841	MLU. IfG
6	2010. Sew-490	Tooth	P ²		x	Adult			Giebel 1841	MLU. IfG
7	2010. Sew-491	Tooth	P ³		x	Adult			Giebel 1841	MLU. IfG
8	Ma.7155	Tooth	P ⁴		x	Juvenile			Giebel 1844	Museum für Naturkunde Berlin
9	2010. Sew-488	Tooth	P ⁴		x	Juvenile			Giebel 1841	MLU. IfG
10	Ma.7161	Tooth	M ²		x	Juvenile			Giebel 1844	Museum für Naturkunde Berlin
11	Ma.7162	Tooth	M ²		x	Juvenile			Giebel 1844	Museum für Naturkunde Berlin
12	Ma.7162	Tooth	M ²		x	High adult			Giebel 1844	Museum für Naturkunde Berlin
13	Ma.7159	Tooth	M ²		x	Adult			Giebel 1844	Museum für Naturkunde Berlin
14	2010. Sew-485	Tooth	M ²	x		Early adult			Giebel 1841	MLU. IfG
15	2010. Sew-484	Tooth	M ²	x		Late adult			Giebel 1841	MLU. IfG
16	2010. Sew-486	Tooth	M ²		x	Early adult			Giebel 1841	MLU. IfG
17	2010. Sew-487	Tooth	M ³		x	Juvenile			Giebel 1841	MLU. IfG
18	2010. Sew-481	Tooth	M ³		x	Early adult			Giebel 1841	MLU. IfG
19	2010. Sew-480	Tooth	M ³		x	Adult			Giebel 1841	MLU. IfG
20	2010. Sew-483	Tooth	M ³		x	High adult			Giebel 1841	MLU. IfG
21	2010. Sew-482	Tooth	M ³	x		Adult			Giebel 1841	MLU. IfG
22	Ma.7158	Tooth	M ³	x		Adult			Giebel 1844	Museum für Naturkunde Berlin
23	2010. Sew-495	Mandible	Incomplete with P ₄ -M ₂		x	Early adult			Giebel 1841	MLU. IfG
24	2010. Sew-464	Mandible	Incomplete with M ₁₋₃		x	Adult			Giebel 1841	MLU. IfG
25	Ma.7072	Mandible	Incomplete with P ₄ -M ₃		x	Adult			Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 4 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Old collection	Collection
26	2010. Sew-499	Tooth	P ₁		x	Juvenile			Giebel 1841	MLU. IfG
27	2010. Sew-498	Tooth	P ₂	x		High adult			Giebel 1841	MLU. IfG
28	Ma.7153	Tooth	M ₁	x		Early adult			Giebel 1844	Museum für Naturkunde Berlin
29	2010. Sew-500	Tooth	M ₁		x	Adult			Giebel 1841	MLU. IfG
30	2010. Sew-501	Tooth	M ₁		x	Late adult			Giebel 1841	MLU. IfG
31	2010. Sew-502	Tooth	M ₁	x		Late adult			Giebel 1841	MLU. IfG
32	2010. Sew-503	Tooth	M ₁	x		Late adult			Giebel 1841	MLU. IfG
33	Ma.7163	Tooth	M ₂		x	Late juvenile			Giebel 1844	Museum für Naturkunde Berlin
34	Ma.7154	Tooth	M ₂	x		Adult			Giebel 1844	Museum für Naturkunde Berlin
35	Ma.7151	Tooth	M ₂	x		Early adult			Giebel 1844	Museum für Naturkunde Berlin
36	Ma.7152	Tooth	M ₂		x	Early adult			Giebel 1844	Museum für Naturkunde Berlin
37	2010. Sew-496	Tooth	M ₃		x	Adult			Giebel 1841	MLU. IfG
38	2010. Sew-497	Tooth	M ₃	x		Adult			Giebel 1841	MLU. IfG
39	Ma.7160	Tooth	M ₃	x		Adult			Giebel 1844	Museum für Naturkunde Berlin
40	Ma.7156	Tooth	M ₃	x		Adult			Giebel 1844	Museum für Naturkunde Berlin
41	2010. Sew-504	Tooth	Fragments			Adult-Late adult			Giebel 1841	MLU. IfG

TABLE 5 *Bison priscus* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-425	Radius	Without distal joint	x		Juvenile		Giebel 1841	MLU. IfG
2	2010. Sew-459	Metacarpus	Complete, length = 259, distal width = 96	x		Adult to Late adult		Giebel 1841	MLU. IfG
3	2010. Sew-466	Carpale 2 + 3	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
4	2010. Sew-467	Carpale 2 + 3	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
5	2010. Sew-465	Carpale 2 + 3	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
6	2010. Sew-468	Carpale 2 + 3	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
7	2010. Sew-469	Carpale 4	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
8	Ma.7333	Carpalia	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
9	Ma.7332		Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
10	Ma.7354	Cuneiform	Complete		x	Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
11	Ma.7353	Cuneiform	Incomplete		x	Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
12	Ma.7331	Ulnare	Complete			Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
13	2010. Sew-457	Ulnare	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
14	2010. Sew-458	Intermedium	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
15	2010. Sew-470	Radial	Incomplete	x		Juvenile		Giebel 1841	MLU. IfG
16	2010. Sew-457	Radial	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
17	Ma.24094	Cervical vertebra	C6, Incomplete			Late juvenile		Giebel 1844	Museum für Naturkunde Berlin
18	2010. Sew-477	Cervical vertebra	C, Incomplete			Adult to Late adult		Giebel 1841	MLU. IfG
19	Ma.24103	Thoracic vertebra	Incomplete			Late juvenile		Giebel 1844	Museum für Naturkunde Berlin
20	2010. Sew-463	Costa	Incomplete			Juvenile		Giebel 1841	MLU. IfG
21	2010. Sew-426	Femur	Without joints		x	Juvenile		Giebel 1841	MLU. IfG
22	2010. Sew-462	Naviculare	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG

(Continues)

TABLE 5 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
23	2010. Sew-426	Naviculare	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
24	2010. Sew-422	Metatarsus	Complete, length = 292, distal width = 79 (Male)		x	Adult to Late adult		Giebel 1841	MLU. IfG
25	2010. Sew-423	Metatarsus	Without distal joint		x	Juvenile		Giebel 1841	MLU. IfG
26	2010. Sew-424	Metatarsus	Complete, length = 291, distal width = 73 (Female)	x		Adult to Late adult		Giebel 1841	MLU. IfG
27	2010. Sew-421	Metatarsus	Complete, length = 292, distal width = 72 (Female)		x	Adult to Late adult		Giebel 1841	MLU. IfG
28	Ma.7270	Astragalus	Incomplete	x		Adult to Late adult	x	Krüger 1836 1836	Museum für Naturkunde Berlin
29	Ma.7271	Astragalus	Incomplete	x		Adult to Late adult	x	Krüger 1836 1836	Museum für Naturkunde Berlin
30	Ma.7272	Astragalus	Incomplete	x		Adult to Late adult	x	Krüger 1836 1836	Museum für Naturkunde Berlin
31	Ma.7274	Astragalus	Incomplete		x	Adult to Late adult	x	Krüger 1836 1836	Museum für Naturkunde Berlin
32	2010. Sew-453	Astragalus	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
33	2010. Sew-454	Astragalus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
34	2010. Sew-455	Astragalus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
35	2010. Sew-460	Astragalus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
36	Ma.7320	Calcaneus	Incomplete		x	Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
37	2010. Sew-460	Calcaneus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
38	Ma.7323	Calcaneus	Incomplete	x		Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
39	Ma.7321	Calcaneus	Incomplete		x	Early adult		Krüger 1836 1836	Museum für Naturkunde Berlin
40	Ma.7329	Intermedium	Incomplete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
41	Ma.7226	Metatarsus	Without distal joint	x		Early adult		Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 5 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
42	Ma.7225	Metatarsus	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
43	Ma.7349	Phalanx I	Complete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
44	2010. Sew-430	Phalanx I	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
45	2010. Sew-425	Phalanx I	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
46	2010. Sew-432	Phalanx I	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
47	2010. Sew-424	Phalanx I	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
48	2010. Sew-431	Phalanx I	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
49	2010. Sew-434	Phalanx I	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
50	2010. Sew-427	Phalanx I	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
51	2010. Sew-433	Phalanx I	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
52	2010. Sew-429	Phalanx I	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
53	2010. Sew-426	Phalanx I	Complete		x	Juvenile		Giebel 1841	MLU. IfG
54	Ma.7348	Phalanx I	Complete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
55	Ma.7350	Phalanx I	Incomplete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
56	2010. Sew-435	Phalanx II	Without proximal joint		x	Juvenile		Giebel 1841	MLU. IfG
57	2010. Sew-445	Phalanx II	Without proximal joint	x		Juvenile		Giebel 1841	MLU. IfG
58	2010. Sew-436	Phalanx II	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
59	2010. Sew-437	Phalanx II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
60	2010. Sew-446	Phalanx II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
61	2010. Sew-439	Phalanx II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
62	2010. Sew-438	Phalanx II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
63	Ma.7352	Phalanx II	Incomplete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
64	Ma.7345	Phalanx III	Complete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
65	Ma.7344	Phalanx III	Incomplete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
66	2010. Sew-440	Phalanx III	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG

(Continues)

TABLE 5 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
67	2010. Sew-447	Phalanx III	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
68	2010. Sew-441	Phalanx III	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
69	2010. Sew-519	Phalanx III	Complete			Calf		Giebel 1841	MLU. IfG
70	2010. Sew-443	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
71	2010. Sew-442	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
72	2010. Sew-449	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
73	2010. Sew-450	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG

individual age, a mandible fits by its dentition (Figure 4.8). Other cranial remains are a ceratohyal bone (Figure 4.3) and other braincase or maxillary fragments of grown-up adult to late adult individuals (Figure 4.4–4.7). Several incomplete mandibles are present all with medium to strongly worn teeth (Figure 4.9–4.16). Single tooth is absent of cubs (no milk teeth), and all are from adult to late adult animals (Figure 4.17–4.26). Whereas in total 43 cranial remains are preserved, the postcranial bones consist of 72 pieces of all body regions. Within the forelimb bones which are all from matured animals (Figure 5.1–5.16), only one humerus, two radii and one ulna are complete which are useful for sex identification metric analysis, which has been already made on the complete long bones (see Diedrich, 2011b). Most fractures are modern, but at one ulna and a single humerus, those seem to be incomplete due to cannibalistic bone cracking/chewing damage. Manus pedal bones are present with carpalia, metatarsalgia and phalange (Figure 5.17–5.31). Two metacarpal IV and V fit and have bone growth on their dorsal surfaces (exostosis pathology). The vertebral column is over-represented by the atlas (=most vertebra finds), whereas all positions of vertebrae were found (Figure 5.32–5.48). Two of the vertebrae are from a cub (Figure 5.34, 5.48), all others are from adult individuals. The hind limb long bones (Figure 5.50–5.61) include two complete femora and five complete tibiae. One tibia is from a cub (Figure 5.55), another from an adolescent (Figure 5.57) hyena. The pes pedal bones are less abundant (Figure 5.62–5.64).

2.4.2 | Micromammals

Nehring (1904) listed with little material the following micromammals typical for Early–Middle Late Pleistocene glacial fauna: *Alacta saliens*, *Spermophilus rufescens*, *Lagomys* cf. *pusillus* and *Lepus* cf. *timidus* and hamster *Cricetus vulgaris*. Mice are mentioned as follows: *Microtus gregalis*, *Myodes torquatus*, *Myodes lemmus*. Very important and rare, but not to relocate is the “upper part of a juvenile femur” of the porcupine *Hystrix* (here identified as *H. (Acanthion) brachyura*).

2.4.3 | Birds

A few birds were listed by Nehring (1904): water birds such as *Anser* sp., *Anas* sp., cf. *boschas*, *Anas crecca* and chicken birds such as *Lagopus* cf. *lagopus*.

2.4.4 | Other carnivores

There are some tooth and mainly postcranial leg remains of the steppe lion *Panthera leo spelaea* (discussed in

TABLE 6 *Bos primigenius* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-417	Humerus	Proximally eaten	x		Adult to Late adult	x	Giebel 1841	MLU. IfG
2	2010. Sew-418	Humerus	Proximally eaten	x		Adult to Late adult	x	Giebel 1841	MLU. IfG
3	2010. Sew-420	Radius	Distally eaten, belongs to humerus 2010. Sew-420		x	Adult to Late adult	x	Giebel 1841	MLU. IfG
4	2010. Sew-419	Radius	Distally eaten, belongs to humerus 2010. Sew-417	x		Adult to Late adult	x	Giebel 1841	MLU. IfG
5	Ma.7235	Cuneiform	Complete		x	Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
6	2010. Sew-475	Carpale 3 + 4	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
7	2010. Sew-476	Carpale 3 + 4	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
8	Ma.7246	Metacarpus	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
9	Ma.7223	Metacarpus	Without distal joint	x		Juvenile		Giebel 1844	Museum für Naturkunde Berlin
10	2010. Sew-448	Naviculare	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
11	2010. Sew-471	Malleolar	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
12	Ma.7241	Metatarsus	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
13	Ma.7224	Metatarsus	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
14	2010. Sew-415	Metatarsus	Complete, length = 314, distal width = 87	x		Adult to Late adult		Giebel 1841	MLU. IfG
15	Ma.7322	Calcaneus	Incomplete		x	Adult to Late adult	x	Krüger 1836 1836	Museum für Naturkunde Berlin
16	2010. Sew-461	Calcaneus	Incomplete	x		Adult to Late adult		Giebel 1841	MLU. IfG
17	Ma.7277	Astragalus	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
18	Ma.7273	Astragalus	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
19	2010. Sew-451	Astragalus	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
20	2010. Sew-416	Phalanx I	Incomplete		x	Adult to Late adult	x	Giebel 1841	MLU. IfG
21	Ma.7351	Phalanx I	Complete			Adult to Late adult		Krüger 1836 1836	Museum für Naturkunde Berlin
22	2010. Sew-473	Phalanx II	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
23	2010. Sew-474	Phalanx II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
24	2010. Sew-472	Phalanx III	Complete			Adult to Late adult		Giebel 1841	MLU. IfG

TABLE 7 *Ovibos moschatus* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.24926	Cervical vertebra	Centrum					Giebel 1844	Museum für Naturkunde Berlin

TABLE 8 *Equus caballus fossilis* (large horse) remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-300	Maxillary	Complete tooth row right P ² -M ³ , left row P ³ M ²	x		Adult		Giebel 1841	MLU. IfG
2	2010. Sew-322	Metacarpus	Complete, length = ,242 distal width = 57		x	Adult to Late adult		Giebel 1841	MLU. IfG
3	2010. Sew-321	Metacarpus	Complete, length = 245 distal width = 57	x		Adult to Late adult		Giebel 1841	MLU. IfG
4	2010. Sew-347	Thoracic vertebra	T1			Early adult		Giebel 1841	MLU. IfG
5	2010. Sew-348	Thoracic vertebra	Middle			Early adult		Giebel 1841	MLU. IfG
6	2010. Sew-320	Calcaneus	Complete, length = 127 width = 65	x		Adult to Late adult		Giebel 1841	MLU. IfG

Diedrich, 2011a; Figure 7.1–7.15). Most other carnivore remains are wolf finds of *Canis lupus* cf. *spelaeus* (Figure 7.16–7.63), which were attributed by Nehring (1904) to a “schakel.” All other smaller carnivores such as *Mustela putorius* (Figure 7.67–7.69) *Mustela eversmanni* (in Nehring, 1904), and *Meles meles* (Figure 7.65–7.66) or *Alopex lagopus* (in Nehring, 1904), *Vulpes vulpes* (Figure 7.64) are represented mainly by few cranial remains.

2.4.5 | Hyena guilt remains

About 775 bones of different macromammals are listed (Table 2-14), which cannot all (but most) simply be attributed only to be of hyena den origin, as discussed later.

Mammuthus primigenius (Figure 6): Six (27%) are cranial and molar tooth remains of 16 mammoth bones (Table 2). The material of at least one individual of a very young calf consists of a maxillary, mandible fragment with teeth, pelvic remains and fibula such as metapodial bones (Figure 6.1-6.3 and Figures 7-11). All other molar teeth are from early adults (Figure 6.4–6.6), whereas pedal bones are unclear in the individual age (Figure 6.12–6.13). Seventy nine percent are from a calf, the rest from early adults, and possibly foot remains from mature elephants. The NISP of the prey fauna is 2%.

Coelodonta antiquitatis (Figures 7-14): There is no complete skull, nor complete lower jaw. The cranial material takes 37% of the bone material, which includes leg remains and

vertebral column elements. Many isolated teeth have been found (Table 3), whereas after checking in several cases, some teeth built rows, and those belonged to each different skulls which are from calves to late adult (Figures 7-10). The dentition and maxillaries of at least one calf in full milk dentition (Figure 7.3 and 7.5) such as two lower jaws in similar milk dentition (Figure 7.4 and 7.11), indicates at two individuals a young age. At least three individuals in early adult age (Figure 7.6–7.7) are determined on the premolar teeth. Adult animals are present with minimum of one frontal bone, skull dentition and lower jaw (Figure 8.1-2 and 8.6-7). The most complete skull dentition is from a late adult individual (Figure 9), where most probably three individuals have been present. Remains of at minimum two late adult individuals were arranged to one skull (Figure 10). The postcranial remains allow to compose even complete fore (Figure 11) and hind legs (Figure 13) with their carpalia and tarsalia and distal pedal bones. In one case, the femur and tibia seem to belong to a right hind leg of one calf (Figure 13.8-9). From calves, there is also a left mc (Figure 11.7). The thorax is represented by few vertebrae and pelvic remains (Figure 12), whereas a fitting atlas/axes seem to originate from a single individual. Whereas most material is damaged mining, only 15% of the non-cranial bones herein have typical hyena bite marks or represent medium bone damage stages (Figure 12.8, Figure 14.1–14.7). Using all 147 cranial and postcranial remains in three age classes, the rhinoceros remains are as follows: (a) 11% calves, (b) 10% early adults and (c) 79% adults to late adults.

TABLE 9 *Equus caballus przewalski* (small horse) remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.25032, Ma.25033, 2010. Sew-275	Skull	Incomplete, with right P ²⁻⁴ , M ¹⁻³ , left P ²⁻³ , M ¹⁻²	x	x	Late adult		Giebel 1844	Museum für Naturkunde Berlin, and MLU. IfG
2	2010. Sew-308	Maxillary	With dm1-2	x		Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
3	2010. Sew-248	Premaxillary	di ⁻³	x	x	Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
4	Ma.25034	Maxillary	With M ¹			Adult		Giebel 1844	Museum für Naturkunde Berlin
5	2010. Sew-249	Tooth	di ¹			Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
6	2010. Sew-250	Tooth	di ²			Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
7	2010. Sew-309	Tooth	dm ²	x		Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
8	2010. Sew-310	Tooth	dm ²	x		Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
9	2010. Sew-311	Tooth	dm ²		x	Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
10	2010. Sew-312	Tooth	dm ²		x	Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
11	2010. Sew-251	Tooth	I ²	x		Adult		Giebel 1844	MLU. IfG
12	2010. Sew-252	Tooth	I ³	x		Adult		Giebel 1844	MLU. IfG
13	2010. Sew-257	Tooth	I ³		x	Adult		Giebel 1844	MLU. IfG
14	2010. Sew-286	Tooth	P ²	x		Late adult		Giebel 1844	MLU. IfG
15	2010. Sew-294	Tooth	P ²		x	Late adult		Giebel 1844	MLU. IfG
16	2010. Sew-295	Tooth	P ²		x	Adult		Giebel 1844	MLU. IfG
17	2010. Sew-296	Tooth	P ²	x		Adult		Giebel 1844	MLU. IfG
18	2010. Sew-297	Tooth	P ²	x		Adult		Giebel 1882	MLU. IfG
19	2010. Sew-298	Tooth	P ²	x		Adult		Giebel 1844	MLU. IfG
20	2010. Sew-299	Tooth	P ²	x		Late adult		Giebel 1844	MLU. IfG
21	2010. Sew-301	Tooth	P ²	x		Adult		Giebel 1844	MLU. IfG
22	2010. Sew-302	Tooth	P ²	x		Adult		Giebel 1844	MLU. IfG
23	2010. Sew-303	Tooth	P ²	x		Early adult		Giebel 1844	MLU. IfG
24	2010. Sew-304	Tooth	P ²		x	Adult		Giebel 1844	MLU. IfG
25	2010. Sew-293	Tooth	P ³	x		Late adult		Giebel 1844	MLU. IfG
26	2010. Sew-277	Tooth	P ⁴	x		Adult		Giebel 1844	MLU. IfG
27	2010. Sew-276	Tooth	P ⁴		x	High adult		Giebel 1844	MLU. IfG
28	2010. Sew-283	Tooth	P ⁴	x		Late adult		Giebel 1844	MLU. IfG
29	2010. Sew-289	Tooth	P ⁴	x		Late adult		Giebel 1844	MLU. IfG
30	2010. Sew-290	Tooth	P ⁴		x	Late adult		Giebel 1844	MLU. IfG
31	2010. Sew-379	Tooth	P ³ -M ²		x	Juvenile		Giebel 1844	MLU. IfG
32	2010. Sew-291	Tooth	M ¹	x		Late adult		Giebel 1844	MLU. IfG
33	2010. Sew-292	Tooth	M ¹		x	Late adult		Giebel 1844	MLU. IfG

(Continues)

TABLE 9 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
34	2010. Sew-278	Tooth	M ¹	x		Adult		Giebel 1844	MLU. IfG
35	2010. Sew-279	Tooth	M ¹		x	Adult		Giebel 1844	MLU. IfG
36	2010. Sew-287	Tooth	M ¹	x		Late adult		Giebel 1844	MLU. IfG
37	2010. Sew-288	Tooth	M ¹	x		Late adult		Giebel 1844	MLU. IfG
38	2010. Sew-280	Tooth	M ²		x	Adult		Giebel 1844	MLU. IfG
39	2010. Sew-281	Tooth	M ²		x	High adult		Giebel 1844	MLU. IfG
40	2010. Sew-358	Tooth	M ²		x	Early adult		Giebel 1844	MLU. IfG
41	2010. Sew-356	Tooth	M ²		x	Early adult		Giebel 1844	MLU. IfG
42	2010. Sew-357	Tooth	M ²		x	Late adult		Giebel 1844	MLU. IfG
43	2010. Sew-282	Tooth	M ³	x		Adult		Giebel 1844	MLU. IfG
44	2010. Sew-284	Tooth	M ³	x		Late adult		Giebel 1844	MLU. IfG
45	2010. Sew-285	Tooth	M ³		x	Late adult		Giebel 1844	MLU. IfG
46	2010. Sew-306	Tooth	M ³		x	Adult		Giebel 1844	MLU. IfG
47	2010. Sew-307	Tooth	M ³	x		High adult		Giebel 1844	MLU. IfG
48	2010. Sew-351	Mandible	With P ₃ -M ₃	x		Adult		Giebel 1844	MLU. IfG
49	2010. Sew-371	Mandible	Incomplete, and isolated teeth	x	x	Adult		Giebel 1844	MLU. IfG
50	2010. Sew-376	Tooth	dm ₁₋₃	x		Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
51	2010. Sew-377	Tooth	dm ₃			Early juvenile (2 weeks)		Giebel 1844	MLU. IfG
52	2010. Sew-256	Tooth	I ₁	x		Adult		Giebel 1844	MLU. IfG
53	2010. Sew-254	Tooth	I ₂	x		Adult		Giebel 1844	MLU. IfG
54	2010. Sew-255	Tooth	I ₂	x		Adult		Giebel 1844	MLU. IfG
55	2010. Sew-257	Tooth	I ₃		x	Adult		Giebel 1844	MLU. IfG
56	2010. Sew-258	Tooth	I ₃		x	Juvenile		Giebel 1844	MLU. IfG
57	2010. Sew-259	Tooth	I ₃		x	Juvenile		Giebel 1844	MLU. IfG
58	2010. Sew-260	Tooth	I ₃	x		Juvenile		Giebel 1844	MLU. IfG
59	2010. Sew-351	Tooth	Incomplete with P ₃₋₄ , M ₁₋₃		x	Adult		Giebel 1844	MLU. IfG
60	2010. Sew-360	Tooth	Dentition, M ₂₋₃		x	Adult		Giebel 1844	MLU. IfG
61	2010. Sew-361	Tooth	Dentition, P ₂₋₄	x		Adult		Giebel 1844	MLU. IfG
62	2010. Sew-362	Tooth	Dentition, P ₃₋₄	x		Adult		Giebel 1844	MLU. IfG
63	2010. Sew-363	Tooth	Dentition, P ₂₋₄ , M ₁		x	High adult		Giebel 1844	MLU. IfG
64	2010. Sew-364	Tooth	Dentition, P ₂₋₃ , M ₁₋₂	x		Adult		Giebel 1844	MLU. IfG
65	2010. Sew-365	Tooth	Dentition, P ₄ , M ₁	x		High adult		Giebel 1844	MLU. IfG
66	2010. Sew-366	Tooth	Dentition, P ₄ , M ₁	x		High adult		Giebel 1844	MLU. IfG
67	2010. Sew-367	Tooth	Dentition, left P ₃₋₄ , M ₁ , right P ₄	x	x	Late adult		Giebel 1844	MLU. IfG
68	2010. Sew-375	Tooth	P ₂	x		Juvenile		Giebel 1844	MLU. IfG
69	2010. Sew-374	Tooth	P ₂		x	Juvenile		Giebel 1844	MLU. IfG
70	2010. Sew-378	Tooth	P ₂		x	Late adult		Giebel 1844	MLU. IfG
71	2010. Sew-267	Tooth	P ₂	x		Late adult		Giebel 1844	MLU. IfG

(Continues)

TABLE 9 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
72	2010. Sew-269	Tooth	P ₂	x		High adult		Giebel 1844	MLU. IfG
73	2010. Sew-271	Tooth	P ₂	x		Late adult		Giebel 1844	MLU. IfG
74	2010. Sew-272	Tooth	P ₂	x		Adult		Giebel 1844	MLU. IfG
75	2010. Sew-263	Tooth	P ₂			High adult		Giebel 1844	MLU. IfG
76	2010. Sew-264	Tooth	P ₃			Adult		Giebel 1844	MLU. IfG
77	2010. Sew-266	Tooth	P ₃		x	Adult		Giebel 1844	MLU. IfG
78	2010. Sew-370	Tooth	P ₃		x	Early adult		Giebel 1844	MLU. IfG
79	2010. Sew-273	Tooth	P ₃	x		Adult		Giebel 1844	MLU. IfG
80	2010. Sew-274	Tooth	P ₄	x		High adult		Giebel 1844	MLU. IfG
81	2010. Sew-270	Tooth	P ₄	x		Adult		Giebel 1844	MLU. IfG
82	2010. Sew-268	Tooth	M ₁	x		Early adult		Giebel 1844	MLU. IfG
83	2010. Sew-305	Tooth	M ₁	x		Late adult		Giebel 1844	MLU. IfG
84	2010. Sew-369	Tooth	M ₁		x	Adult		Giebel 1844	MLU. IfG
85	2010. Sew-265	Tooth	M ₂		x	Early adult		Giebel 1844	MLU. IfG
86	2010. Sew-372	Tooth	M ₂	x		Late adult		Giebel 1844	MLU. IfG
87	2010. Sew-262	Tooth	M ₂	x		Adult		Giebel 1844	MLU. IfG
88	2010. Sew-368	Tooth	M ₂	x		Early adult		Giebel 1844	MLU. IfG
89	2010. Sew-261	Tooth	M ₃	x		Late adult		Giebel 1844	MLU. IfG
90	2010. Sew-354	Tooth	M ₃	x		Early adult		Giebel 1844	MLU. IfG
91	2010. Sew-359	Tooth	M ₃		x	Late adult		Giebel 1844	MLU. IfG
92	2010. Sew-352	Tooth	M ₃	x		Adult		Giebel 1844	MLU. IfG
93	2010. Sew-355	Tooth	M ₃		x	Adult		Giebel 1844	MLU. IfG
94	2010. Sew-353	Tooth	M ₃	x		Early adult		Giebel 1844	MLU. IfG
95	III/51/1579a	Tooth	M			Early adult			Museum Quedlinburg
96	III/51/1579-b	Tooth	M ₃			Early adult			Museum Quedlinburg
97	2010. Sew-373	Tooth	Indet, Fragment			Early adult		Giebel 1844	MLU. IfG
98	2010. Sew-339	Scapula	Incomplete		x	Adult to Late adult		Giebel 1844	MLU. IfG
99	2010. Sew-337	Scapula	Incomplete		x	Adult to Late adult		Giebel 1844	MLU. IfG
100	2010. Sew-338	Scapula	Incomplete	x		Adult to Late adult		Giebel 1844	MLU. IfG
101	Ma.24043	Scapula	Incomplete	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
102	Ma.24074	Humerus	Without distal half	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
103	2010. Sew-343	Humerus	Distal half	x		Adult to Late adult		Giebel 1841	MLU. IfG
104	2010. Sew-342	Ulna	Incomplete		x	Early adult to late adult		Giebel 1841	MLU. IfG
105	2010. Sew-340	Ulna/Radius	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
106	Ma.24002	Radius	Without distal joint		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 9 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
107	Ma.28334	Radius	Incomplete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
108	2010. Sew-341	Radius	Without distal joint		x	Early adult	x, bite scratches, distally	Giebel 1841	MLU. IfG
109	Quedl-Sew-12	Radius	Complete	x		Adult to Late adult			Museum Quedlinburg
110	Quedl-Sew-13	Radius	Nearly complete	x		Adult to Late adult			Museum Quedlinburg
111	Ma.29835	Carpale	Complete		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
112	2010. Sew-390	Carpale II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
113	2010. Sew-391	Carpale II	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
114	2010. Sew-392	Carpale III	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
115	2010. Sew-393	Carpale III	Incomplete		x	Adult to Late adult		Giebel 1841	MLU. IfG
116	2010. Sew-394	Carpale III	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
117	2010. Sew-478	Carpale III	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
118	2010. Sew-395	Intermedium	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
119	2010. Sew-396	Radial	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
120	2010. Sew-397	Radial	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
121	2010. Sew-398	Radial	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
122	2010. Sew-390	Carpale IV	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
123	2010. Sew-400	Carpale IV	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
124	2010. Sew-335	Metacarpus	Complete, length = 235 distal width = 55	x		Adult to Late adult		Giebel 1841	MLU. IfG
125	2010. Sew-334	Metacarpus	Complete, length = 227 distal width = 53		x	Adult to Late adult		Giebel 1841	MLU. IfG
126	2010. Sew-329	Metacarpus	Complete, length = 230 distal width = 52		x	Adult to Late adult	x, distal bite marks	Giebel 1841	MLU. IfG
127	2010. Sew-412	Metacarpus IV	Incomplete	x		Adult to Late adult		Giebel 1841	MLU. IfG
128	Ma.24089	Cervical vertebra	Atlas, incomplete			Adult to Late adult		Coll. Krüger 1836	Museum für Naturkunde Berlin

(Continues)

TABLE 9 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
129	2010. Sew-346	Cervical vertebra	Atlas, incomplete			Adult to Late adult		Giebel 1841	MLU. IfG
130	Ma.24090	Cervical vertebra	Axes, incomplete			Adult to Late adult		Krüger 1836	Museum für Naturkunde Berlin
131	Ma.24091	Cervical vertebra	C3 order 4			Adult to Late adult		Krüger 1836	Museum für Naturkunde Berlin
132	Ma.24092	Cervical vertebra	C6			Adult to Late adult		Krüger 1836	Museum für Naturkunde Berlin
133	Ma.24093	Cervical vertebra	C6			Adult to Late adult		Krüger 1836	Museum für Naturkunde Berlin
134	Ma.24095	Cervical vertebra	C7			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
135	2010. Sew-349	Thoracic vertebra	Middle			Adult to Late adult		Giebel 1841	MLU. IfG
136	2010. Sew-350	Thoracic vertebra	Middle			Adult to Late adult		Giebel 1841	MLU. IfG
137	Ma.24099	Thoracic vertebra	Middle			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
137	Ma.24098	Thoracic vertebra	Middle			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
138	Ma.23977	Pelvis	Coxa		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
139	Ma.23941	Pelvis	Coxa	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
140	Ma.23942	Pelvis	Coxa		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
141	Ma.23939	Pelvis	Coxa	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
142	Ma.23940	Pelvis	Coxa		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
143	Ma.23945	Femur	Without distal joint		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
144	Ma.23946	Femur	Shaft		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
145	Ma.23944	Femur	Without proximal joint		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
146	Ma.23947	Femur	Distal part	x		Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
147	Ma.23943	Femur	Shaft, without joints			Juvenile		Giebel 1844	Museum für Naturkunde Berlin
148	2010. Sew-345	Patella	Incomplete	x		Adult to Late adult		Giebel 1841	MLU. IfG
149	2010. Sew-344	Patella	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
150	Ma.24157	Tibia	Distal half	x		Adult to Late adult	cracked	Giebel 1844	Museum für Naturkunde Berlin
151	2010. Sew-336	Metatarsus	Without distal joint	x		Adult to Late adult		Giebel 1841	MLU. IfG

(Continues)

TABLE 9 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
152	2010. Sew-413	Metapod II or IV	Incomplete			Adult		Giebel 1841	MLU. IfG
153	2010. Sew-414	Metapod II or IV	Incomplete			Adult		Giebel 1841	MLU. IfG
154	2010. Sew-403	Tarsale III	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
155	2010. Sew-402	Tarsale III	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
156	2010. Sew-401	Tarsale III	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
157	2010. Sew-404	Tarsale IV	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
158	2010. Sew-405	Tarsale IV	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
159	2010. Sew-406	Tarsale IV	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
160	2010. Sew-407	Tarsale IV	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
161	2010. Sew-408	Centrale	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
162	2010. Sew-409	Centrale	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
163	2010. Sew-410	Centrale	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
164	2010. Sew-411	“Strahlbein”	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
165	2010. Sew-323	Calcaneus	Incomplete		x	Adult to Late adult		Giebel 1841	MLU. IfG
166	2010. Sew-327	Calcaneus	Incomplete, without distal joint	x		Early adult		Giebel 1841	MLU. IfG
167	2010. Sew-328	Calcaneus	Incomplete, without distal joint	x		Early juvenile		Giebel 1841	MLU. IfG
168	2010. Sew-324	Calcaneus	Incomplete, without distal joint		x	Early adult		Giebel 1841	MLU. IfG
169	2010. Sew-331	Astragalus	Complete		x	Adult to Late adult		Giebel 1841	MLU. IfG
170	2010. Sew-330	Astragalus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
171	2010. Sew-332	Astragalus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
172	2010. Sew-333	Astragalus	Complete	x		Adult to Late adult		Giebel 1841	MLU. IfG
173	2010. Sew-380	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
174	2010. Sew-381	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG

(Continues)

TABLE 9 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
175	2010. Sew-382	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
176	2010. Sew-383	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
177	2010. Sew-384	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
178	2010. Sew-385	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
180	2010. Sew-386	Sesamoid	Incomplete			Adult to Late adult		Giebel 1841	MLU. IfG
181	2010. Sew-387	Sesamoid	Incomplete			Adult to Late adult		Giebel 1841	MLU. IfG
182	2010. Sew-388	Sesamoid	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
183	2010. Sew-389	Sesamoid	Complete			Early juvenile		Giebel 1841	MLU. IfG
184	2010. Sew-313	Phalanx I	Incomplete			Juvenile		Giebel 1841	MLU. IfG
185	2010. Sew-314	Phalanx I	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
186	2010. Sew-315	Phalanx I	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
187	2010. Sew-316	Phalanx I	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
188	2010. Sew-317	Phalanx I	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
189	2010. Sew-318	Phalanx I	Complete			Adult to Late adult		Giebel 1841	MLU. IfG
190	Quedl-Sew-14	Phalanx I	Complete			Adult to Late adult			Museum Quedlinburg
191	2010. Sew-319	Phalanx III	Complete			Adult to Late adult		Giebel 1841	MLU. IfG

Bison priscus: The teeth and cranial remains can be determined only as “bovids (Table 4) of which most materials, including calf remains, seem to belong to *B. priscus* (Figure 15.1-15.7). Most bovid remains are attributed to the steppe bison with 73 postcranial bones. Compared to the *B. primigenius* remains, a NISP amount of 108 bones is estimated. Similar as in *Bos*, complete distal legs must have been present in articulation demonstrated on a hind leg composite (Figure 15.27-15.37). In *Bison*, there is a higher amount of calf remains, of which a hind leg was composed (Figure 15.20-15.24). Whereas the metacarpal are much wider in *Bison* (Figure 15.19) as in *Bos* (Figure 16.5), the metatarsi are smaller and proximally less in width in *Bison* (Figure 15.30) as in *Bos* (Figure 16.11). In total, the calf to adolescent remains in *Bison* count 15%.

Bos primigenius: Twenty four postcranial bones are more or less well attributable to this bovid (Table 6, Figure 16). Also, two articulated front legs seem to refer to *Bos* rather

than to *Bison*, and those are typically hyena carnivore damaged with proximal zigzag margins on the humeri, and cracked distal parts of the radii (Figure 16.1-16.2). The *Bos* material seems to be in 99% only from grown-up individuals. It also contains similar as in *Bison* and *Equus* complete legs here in arrangement (Figure 16.8-16.15), which represent typical distal articulated legs found at hyena dens, which were not further consumed by the carnivores. Compared to the *Bison* remains, a total NISP amount of 37 bones is estimated.

Ovibos moschatus: A single cervical vertebra centrum and a right metacarpus from possibly one or two adult animals are represented (Figure 16.16-16.17).

Equus ferus fossilis: There are only six bones which can be selected most secure from the horse material to belong to a larger-sized horse (Table 8). Some phalanx bones and possibly some teeth listed under the smaller *E. c. przewalskii* might belong to the large horse type. Interesting is the presence of a left complete tooth set of an adult individual (Figure 18.2). A

large-sized metacarpus (Figure 18.1), with length of 242 mm, and distal width of 57 mm, and a second non-figured one with similar proportions (Table 8), falls within large horses as discussed later in the comparative study to the metapodial sizes in all the horse materials from Sewecken-Berge.

Equus ferus przewalskii: Most horse remains are from this small horse, whereas this is the most abundant mega-fauna at Sewecken-Berge with remains of all body regions (Figure 17), but dominant isolated teeth (51% of the bones) and distal leg elements (%), Table 9). There are few foal cranial and postcranial remains of a 2-week-old horse (Figures 17.1–17.4 and 17.6–17.7), and of another older foal and early adult. Here, the isolated teeth were fitted to tooth rows, all fitting to a single skull. Typically at hyena den sites, only single teeth remained, because the thin-walled skulls did not survive the feeding. However, it seems remains of one skull of a late adult individual are present with a right and left maxillary (Figure 17.8–17.9). Upper and lower jaws are indirectly indicated by the presence of composed incomplete tooth sets (Figures 17.10–17.11, 17.13–17.17). Also those support the importation of skulls and lower jaws, which were cracked and damaged at the den site, where only teeth were left, which hyenas even cannot destroy. Furthermore, important are composite legs such as a fore-leg (Figure 17.18–17.32) or hind leg (Figure 17.42–17.49).

Several vertebrae and pelvic remains all of adult horses (Figure 17.33–17.41). The horse material is similar as the woolly rhinoceros bones only in few cases typically hyena damaged. A scapula, humerus and tibia are cracked even in the massive areas (Figure 17.18–17.19, and 17.49). Only a radius of an adolescent horse has medium-sized carnivore bite scratches distally (Figure 17.5). In total, only 5% of the Przewalski horse postcranial bones expose carnivore bite and crack damage. The bone NISP of the prey fauna counts 191 (=26%). The individual age statistics is also important to understand the hunting selection by carnivores: a. 1% (NISP = 19) foals, b. 8% (NISP = 16) adolescents and c. 85% (NISP = 156) grown-up to late adult.

Equus hemionus hemionus: It is the smallest equid represented with 10 teeth and postcranial elements. The metrics of the metapodials can be obtained in Table 10. The incisive and molar teeth (Figure 18.4–18.6) are much smaller as the ones of the horses mentioned above. Also the metacarpus (Figure 18.7) and metatarsus (Figure 18.8) are slim such as the phalange (Figure 18.9–18.10). All remains seem to be from adult to late adult animals and might belong to a single individual. The percentage of the prey fauna is 1% only.

Megaloceros giganteus: One maxillary fragment and possibly one vertebra centrum are from mature deers (Table 11). This cervid contributes with only 0,1% on the prey fauna assemblage.

TABLE 10 *Equus hemionus hemionus* (Ice Age donkey) remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-247	Tooth	I ¹⁻³ left, I ¹⁻² right	x	x	High adult		Giebel 1841	MLU. IfG
2	2010. Sew-246	Tooth	I ³		x	High adult		Giebel 1841	MLU. IfG
3	2010. Sew-242	Tooth	M ¹⁻³		x	High adult		Giebel 1841	MLU. IfG
4	2010. Sew-243	Tooth	P ₂	x		High adult		Giebel 1841	MLU. IfG
5	2010. Sew-245	Tooth	M ₁₋₂	x		High adult		Giebel 1841	MLU. IfG
6	2010. Sew-244	Tooth	M ₃	x		High adult		Giebel 1841	MLU. IfG
7	2010. Sew-241	Metacarpus	Complete, length = 230 distal width = 44		x	High adult		Giebel 1841	MLU. IfG
8	2010. Sew-240	Metatarsus	Incomplete, length = 251 distal width = 37		x	High adult		Giebel 1841	MLU. IfG
9	2010. Sew-239	Phalanx I	Complete			High adult		Giebel 1841	MLU. IfG
10	2010. Sew-238	Phalanx III	Incomplete			High adult		Giebel 1841	MLU. IfG

TABLE 11 *Megaloceros giganteus* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.7157	Cranium	Maxillary fragment with P2		x	Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
2	Ma.24102	Thoracic vertebra	Centrum			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin

TABLE 12 *Rangifer tarandus* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.21158	Antler	With cranium fragment	x		Adult		Giebel 1844	Museum für Naturkunde Berlin
2	2010. Sew-506	Antler	With cranium fragment, male		x	Adult		Giebel 1841	MLU. IfG
3	2010. Sew-505	Antler	Fragment, middle part, male			Adult		Giebel 1841	MLU. IfG
4	Quedl-Sew-8	Maxillary	Fragment		x	Adult			Museum Quedlinburg
5	Quedl-Sew-9	Mandible	Incomplete			Early adult			Museum Quedlinburg
6	Quedl-Sew-10	Mandible	Nearly complete			Adult			Museum Quedlinburg
7	2010. Sew-512	Mandible	Fragment, with M ₂₋₃			Adult		Giebel 1841	MLU. IfG
8	Ma.21224	Tooth	P ³		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
9	Ma.21223	Tooth	P ³		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
10	2010. Sew-517	Tooth	P ³	x		High adult		Giebel 1841	MLU. IfG
11	2010. Sew-515	Tooth	P ³		x	Adult		Giebel 1841	MLU. IfG
12	2010. Sew-516	Tooth	P ³	x		High adult		Giebel 1841	MLU. IfG
13	Ma.21225	Tooth	P ⁴		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
14	2010. Sew-514	Tooth	M ¹		x	High adult		Giebel 1841	MLU. IfG
15	Ma.21227	Tooth	M ²		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
16	Ma.21226	Tooth	M ²		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
17	Ma.21228	Tooth	M ³		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
18	2010. Sew-513	Tooth	M ³	x		Adult		Giebel 1841	MLU. IfG
19	Ma.21230	Tooth	M ₂		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
20	Ma.21229	Tooth	M ₂	x		Adult		Giebel 1844	Museum für Naturkunde Berlin
21	2010. Sew-512a	Tooth	M ₂	x		High adult		Giebel 1841	MLU. IfG
22	2010. Sew-507	Humerus	Incomplete, Length = 243 mm Distal width = 51 mm	x		Adult to Late adult		Giebel 1841	MLU. IfG
23	2010. Sew-509	Radius	Distal part	x		Adult to Late adult		Giebel 1841	MLU. IfG
24	2010. Sew-508	Radius	Proximal part		x	Adult to Late adult		Giebel 1841	MLU. IfG
25	2010. Sew-510	Radius	Proximal part	x		Adult to Late adult		Giebel 1841	MLU. IfG
26	2010. Sew-511	Metacarpus	Distal part	x		Adult to Late adult		Giebel 1841	MLU. IfG
27	Quedl-Sew-11	Metacarpus	Complete	x		Adult to Late adult			Museum Quedlinburg
28	Ma.24097	Thoracic vertebra	T1			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 12 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
29	Ma.24100	Thoracic vertebra	T2			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
30	Ma.24107	Thoracic vertebra	T3			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
31	Ma.21182	Calcaneus	Incomplete		x	Adult to Late adult	x	Giebel 1844	Museum für Naturkunde Berlin
32	Ma.21159	Phalanx I	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
33	Ma.21161	Phalanx I	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
34	Ma.21160	Phalanx I	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
35	Ma.21162	Phalanx I	Incomplete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
36	Ma.21165	Phalanx III	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
37	Ma.21166	Phalanx III	Complete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
38	Ma.21163	Phalanx III	Incomplete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin
39	Ma.21164	Phalanx III	Incomplete			Adult to Late adult		Giebel 1844	Museum für Naturkunde Berlin

TABLE 13 *Capreolus capreolus* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	2010. Sew-519	Humerus	Without proximal joint	x		Adult	x	Giebel 1841	MLU. IfG
2	2010. Sew-520	Humerus	Without proximal joint	x		Adult	x	Giebel 1841	MLU. IfG

Rangifer tarandus: 39 teeth and bones (Table 12) are dominated with 19 antler, skull and teeth remains by cranial material (54%, Figure 18.11–18.17), indicating carnivore influence. The fragile postcranial bones, which were cracked easily by hyenas, but also by wolves, are sparsely represented only with few complete bones, such as a humerus (Figure 18.18). Similar as in the other animals, distal leg elements are also overrepresented. In 99%, the material is from mature reindeers. 5% (NISP = 39) is the prey bone amount.

Capreolus capreolus: Only two incomplete humeri with proximally chewed joints have been collected (Figure 18.27–18.28, Table 13).

3 | DISCUSSION

3.1 | The Unicornu fossile “holotype” skeleton osteology

First, the “horn” of the Unicorn seems to originate, after the historical find descriptions and herein presented material

from Sewecken-Berge, not from a narwhale as always discussed (e.g. Abel, 1939; Oekentorp, 1994; Rust, 2002; Thenius & Várva, 1996; Nielbock, 2004), it must originate from a slightly curved straight-tusked (2.35 m long) most probably of the warm period elephant *Palaeoloxodon* (cf. material from Neumark-Nord Lake 1 in Polombo, 2010) or juvenile female *Mammuthus*, which was found in 1663 and which seems to have been used as the Unicorn “horn.” As demonstrated herein, young *Mammuthus* or *Palaeoloxodon* skeleton remains and tusks are present from the Sewecken-Berge, whereas the non-species diagnostic calf remains in Figure 6 might attribute to either to both species.

Second, the general outline of the Unicorn skull (e.g. clear figuration of the nasals: Figure 2f) let attribute either to or both species allows the skull to be attributed to originate only from a “horse,” and not of woolly rhinoceros as reconstructed by Rust (2002); (Figure 2c). *Rhinoceros* has no anterior dentition, nor in the mandibles, nor does have the distinct nasal, nor the general shape being illustrated in Valentini (1714) and Leibnitz (1759). Also the lower jaw has anterior teeth figured in the Unicorn by Leibnitz (1759), which fits anatomically to

TABLE 14 *Panthera leo spelaea* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Old collection	Collection
1	Ma.29613	Tooth	Upper jaw P3, half			Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
2	Ma.29597	Tooth	P4, lower jaw	x		Adult to Late adult	Male		Giebel 1844	Museum für Naturkunde Berlin
3	Ma.29596	Tooth	Half P4, upper jaw		x	Adult to Late adult	Male		Giebel 1844	Museum für Naturkunde Berlin
4	Ma.30069	Tooth	P4, upper jaw	x		Adult to Late adult	Female		Giebel 1844	Museum für Naturkunde Berlin
5	Ma.29598	Tooth	M1, lower jaw		x	Adult to Late adult	Female		Giebel 1844	Museum für Naturkunde Berlin
6	2010. Sew-1	Humerus	Shaft	x		Early adult		Cracked and chewed	Giebel 1844	MLU. IfG
7	2010. Sew-3	Metacarpus	III	x		Adult to Late adult			Giebel 1844	MLU. IfG
8	2010. Sew-2	Metacarpus	V	x		Adult to Late adult			Giebel 1844	MLU. IfG
9	2010. Sew-4	Phalanx	I			Adult to Late adult			Giebel 1844	MLU. IfG
10	2010. Sew-6	Caudal vertebra	Middle			Adult to Late adult			Giebel 1844	MLU. IfG
11	2010. Sew-7	Caudal vertebra	Lower			Adult to Late adult			Giebel 1844	MLU. IfG
12	Ma.30104	Femur	Proximal half			Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
13	2010. Sew-8	Calcaneus	Complete		x	Adult to Late adult	Female		Giebel 1844	MLU. IfG
14	2010. Sew-9	Calcaneus	Complete	x		Adult to Late adult	Female		Giebel 1844	MLU. IfG
15	Ma.30106	Calcaneus	Incomplete		x	Adult to Late adult	Male		Giebel 1844	Museum für Naturkunde Berlin
16	2010. Sew-5	Metatarsus	II	x		Adult to Late adult			Giebel 1844	MLU. IfG
17	2010. Sew-10	Metatarsus	III	x		Adult to Late adult			Giebel 1844	MLU. IfG

TABLE 15 *Canis lupus spelaeus* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Old collection	Collection
1	Ma.28928.1	Maxillary	With P4-M1		x	Late adult			Giebel 1844	Museum für Naturkunde Berlin
2	Ma.28928.2	Maxillary	With M1-2	x		High adult			Giebel 1844	Museum für Naturkunde Berlin
3	Ma.28928.3	Maxillary	With P2-3		x	High adult			Giebel 1844	Museum für Naturkunde Berlin
4	Ma.28928.4	Maxillary	With P2-3	x		High adult			Giebel 1844	Museum für Naturkunde Berlin
5	Ma.28928.5	Maxillary	With P2-3	x		Adult			Giebel 1844	Museum für Naturkunde Berlin
6	2010. Sew-181	Maxillary	With M ¹⁻³		x	Adult			Giebel 1844	MLU. IfG
7	2010. Sew-182	Maxillary	With M ¹⁻²		x	Adult			Giebel 1844	MLU. IfG
8	2010. Sew-183	Maxillary	With M ¹⁻²	x		Late adult			Giebel 1844	MLU. IfG
9	2010. Sew-184	Maxillary	With M ²⁻³	x		Adult			Giebel 1844	MLU. IfG
10	2010. Sew-185	Maxillary	With P ⁴ , M ¹		x	Late adult			Giebel 1844	MLU. IfG
11	2010. Sew-188	Tooth	Caninus			Late adult			Giebel 1844	MLU. IfG
12	2010. Sew-189	Tooth	Caninus			Late adult			Giebel 1844	MLU. IfG
13	2010. Sew-190	Tooth	Caninus			Late adult			Giebel 1844	MLU. IfG
14	2010. Sew-186	Tooth	I ³		x	Adult			Giebel 1844	MLU. IfG
15	2010. Sew-187	Tooth	M ²		x	Late adult			Giebel 1844	MLU. IfG
16	Ma.29304	Mandible	Fragment with C, P ₃	x		Late adult			Giebel 1844	Museum für Naturkunde Berlin
17	Ma.29036	Mandible	Incomplete with P ₂₋₃ , M ₁		x	Adult			Giebel 1844	Museum für Naturkunde Berlin
18	Ma.28967	Mandible	Incomplete, with C, P ₁₋₃		x	High adult			Giebel 1844	Museum für Naturkunde Berlin
19	2010. Sew-195	Mandible	Incomplete with P ₁₋₄	x		High adult			Giebel 1844	MLU. IfG
20	2010. Sew-196	Mandible	Incomplete with left P ₂₋₄ , M ₁ , and right M ₁₋₂	x	x	Late adult			Giebel 1844	MLU. IfG
21	2010. Sew-197	Mandible	Pathology with closed P ₁ alveolus, Incomplete with P ₂₋₄ , M ₁		x	Late adult			Giebel 1844	MLU. IfG
22	2010. Sew-202	Mandible	Incomplete with P ₄ , M ₁	x		Early adult			Giebel 1844	MLU. IfG
23	2010. Sew-193	Tooth	I ₁		x	High adult			Giebel 1844	MLU. IfG
24	2010. Sew-194	Tooth	I ₂		x	High adult			Giebel 1844	MLU. IfG
25	Ma.29037.1	Tooth	P ¹		x	Adult			Giebel 1844	Museum für Naturkunde Berlin

(Continues)

TABLE 15 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Old collection	Collection
26	Ma.29037.2	Tooth	P ₄		x	Adult			Giebel 1844	Museum für Naturkunde Berlin
27	2010. Sew-191	Tooth	P ₄		x	Adult			Giebel 1844	MLU. IfG
28	2010. Sew-192	Tooth	P ₂		x	Adult			Giebel 1844	MLU. IfG
29	Ma.29037.3	Tooth	M1, lower jaw	x		Adult			Giebel 1844	Museum für Naturkunde Berlin
30	Ma.29037.4	Tooth	M3, upper jaw		x	Adult			Giebel 1844	Museum für Naturkunde Berlin
31	2010. Sew-222	Metacarpus I	Complete		x	Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
32	Ma.29829	Metacarpus II	Complete		x	Adult to Late adult	Female		Giebel 1844	Museum für Naturkunde Berlin
33	Ma.29830	Metacarpus II	Complete		x	Adult to Late adult	Male		Giebel 1844	Museum für Naturkunde Berlin
34	Ma.29825	Metacarpus II	Distal half	x		Adult to Late adult	Male		Giebel 1844	Museum für Naturkunde Berlin
35	Ma.29828	Metacarpus III	Complete		x	Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
36	2010. Sew-221	Metacarpus III	Complete		x	Adult to Late adult			Giebel 1844	MLU. IfG
37	Ma.29826	Metacarpus IV	Proximal half		x	Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
38	2010. Sew-220	Metacarpus IV	Complete		x	Adult to Late adult			Giebel 1844	MLU. IfG
39	2010. Sew-219	Metacarpus V	Incomplete		x	Adult to Late adult			Giebel 1844	MLU. IfG
40	2010. Sew-216	Metapod	Distal half			Adult to Late adult			Giebel 1844	MLU. IfG
41	2010. Sew-217	Metapod	Distal half			Adult to Late adult			Giebel 1844	MLU. IfG
42	2010. Sew-218	Metapod	Distal half			Adult to Late adult			Giebel 1844	MLU. IfG
43	2010. Sew-201	Lumbar vertebra	Middle, incomplete			Adult to Late adult			Giebel 1844	MLU. IfG
44	2010. Sew-204	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
45	2010. Sew-205	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
46	2010. Sew-203	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
47	2010. Sew-213	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
48	2010. Sew-214	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
49	2010. Sew-212	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG

(Continues)

TABLE 15 (Continued)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Sex	Bite marks	Old collection	Collection
50	2010. Sew-215	Caudal vertebra	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
51	2010. Sew-206	Costa	Fragment			Adult to Late adult			Giebel 1844	MLU. IfG
52	2010. Sew-207	Costa	Fragment			Adult to Late adult			Giebel 1844	MLU. IfG
53	2010. Sew-208	Costa	Fragment			Adult to Late adult			Giebel 1844	MLU. IfG
54	2010. Sew-209	Costa	Fragment			Adult to Late adult			Giebel 1844	MLU. IfG
55	2010. Sew-210	Costa	Fragment			Adult to Late adult			Giebel 1844	MLU. IfG
56	2010. Sew-211	Costa	Fragment			Adult to Late adult			Giebel 1844	MLU. IfG
57	2010. Sew-200	Pelvis	Sacrum			Adult			Giebel 1844	MLU. IfG
58	2010. Sew-198	Femur	Complete, length =,244 distal width =452	x		Adult to Late adult			Giebel 1844	MLU. IfG
59	2010. Sew-199	Femur	Distal half	x		Adult to Late adult			Giebel 1841	MLU. IfG
60	Ma.858	Femur	Proximal half		x	Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
61	2010. Sew-444	Patella	Complete			Adult to Late adult			Giebel 1841	MLU. IfG
62	Ma.29038	Metatarsus II	Complete		x	Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
63	2010. Sew-225	Metatarsus III	Complete	x		Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
64	2010. Sew-226	Metatarsus III	Incomplete	x		Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
65	Ma.29827	Metatarsus IV	Incomplete	x		Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
66	Ma.29024	Metatarsus IV	Proximal half	x		Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
67	2010. Sew-224	Metatarsus IV	Incomplete	x		Adult to Late adult			Giebel 1844	MLU. IfG
68	2010. Sew-223	Metatarsus V	Complete		x	Adult to Late adult			Giebel 1844	MLU. IfG
69	Ma.29039	Metapod	Distal half		x	Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
70	Ma.29833	Phalanx I	Complete			Adult to Late adult			Giebel 1844	Museum für Naturkunde Berlin
71	2010. Sew-227	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
72	2010. Sew-228	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
73	2010. Sew-229	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
74	2010. Sew-230	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
75	2010. Sew-231	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
76	2010. Sew-232	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
77	2010. Sew-233	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
78	2010. Sew-234	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG
79	2010. Sew-235	Phalanx I	Complete			Adult to Late adult			Giebel 1844	MLU. IfG

TABLE 16 *Vulpes vulpes* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.29037.5	Tooth	Canine		x	Adult		Giebel 1844	Museum für Naturkunde Berlin
2	2010. Sew-237	Tooth	M ¹		x	Adult		Giebel 1844	MLU. IfG
3	2010. Sew-236	Tooth	M ₁		x	Adult		Giebel 1844	MLU. IfG

TABLE 17 *Meles meles* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.29410a	Skull	Maxillary, with P4 and M1		x	Late adult		Giebel 1844	Museum für Naturkunde Berlin
2	Ma.29410b	Mandible	Incomplete, with P2 and M1	x		Late adult		Giebel 1844	Museum für Naturkunde Berlin

TABLE 18 *Mustela putorius* remains from the Sewecken-Berge gypsum karst hyena den near Quedlinburg (Central Germany)

No.	Inv.-No.	Bone type	Commentary	Left	Right	Individual age	Bite marks	Old collection	Collection
1	Ma.29371	Skull	Anterior part with lower jaw			Adult		Giebel 1844	Museum für Naturkunde Berlin
2	Ma.29371a	Humerus	Complete		x	Adult (female)		Giebel 1844	Museum für Naturkunde Berlin
3	Ma.29371b	Humerus	Complete	x		Adult (male)		Giebel 1844	Museum für Naturkunde Berlin

a horse. This figuration compared with an original Przewalski horse skull (Figure 2f) must have led in 1658 to the correct reconstruction of the Unicorn as a “horse-like” animal (cf. Topsell, 1658; Figure 2g).

Third, the postcranial bones used in the Unicorn skeleton can be identified herein to be a composite of the anterior vertebral column and some sternal bones, and forelimbs only (Figure 2g). Connected to the skull, four elongated vertebrae (in both historical illustrations) are figured well by Leibnitz (1759), which are identified herein most probably as the cervical vertebrae 2–5 (Figure 2d), compared to the still preserved Sewecken-Berge fossil Przewalski horse-bone material (cf. Figure 17). Whereas Valentini (1714) has drawn eighth vertebrae with long spines (Figure 2a), in the figure of Leibnitz (1759), there are only six, but five more (in total 11) are indicated to have been present. At least, eight of the anterior thoracic horse vertebrae with their long dorsal spines must have been used for the Unicorn skeleton, but those were mounted there in opposite direction and even mirrored with the spines oriented inwards and downwards. Here, Valentini (1714) is followed by his illustration with the amounts of the vertebrae. In both illustrations, it

seems a horse atlas (cf. Figure 17.33) was used in the lower part, below one or two vertebra centra, and after this, possibly three sternal bones have been composed. The vertebral column of a possibly single individual was mounted anatomically incorrect. The legs of the Unicorn consist of the scapula, but only two long bones and one or two phalange bones, each. An anatomical incorrectness was made in those illustrations/reconstructions, because there are three long bones in the front legs: the humerus, fused radius/ulna and the metacarpus (cf. Figure 17). Compared to the preserved fossil Przewalski horse material, the illustrated bones seem to be the radius/ulna and metacarpal bones, because those are long, whereas the humerus is short, massive and different in shape as in the illustrations. The front legs were composed of the horse scapula, ulna/radius, metacarpus and phalanx I and phalanx III. As demonstrated later, all those horse bones are represented several times (Figure 17), but are present partly only in younger obtained collections, which therefore cannot be the originals to the “holotype Unicorn skeleton.” In the Quedlinburg Museum, two horse radii, and one phalanx I and some teeth are still present, so possibly some of the “holotype skeleton” bones have survived.

Finally, the Quedlinburg Unicorn must be seen using the bone proportions and osteologically analysed bone types of the Valentini (1714) and Leibnitz (1759) reconstructions as a composite most probably of a tusk of the straight-tusked elephant *Palaeoloxodon antiquus*) or juvenile female mammoth *Mammuthus primigenius* (has also slender and more straight tusks in younger individual ages), and anterior part of a horse *Equus ferus fossilis* or *Equus ferus przewalskii* individual skeleton, or several horse skeleton parts. Such horse individual skeleton body pieces are present from the site (cf. Figure 17) which fits well to a hyena den bone assemblage taphonomy situation, as demonstrated later.

Comparing the mentioned Unicorn literature, the Unicorn fairy tale animal was always illustrated as a horse with a horn (mostly narwhale horn, because in those times those were exchanged with fossil elephant tusks; Rust, 2002), but incorrectly quadrupedal (see Topsell, 1658). Following the original skeleton reconstructions in history and the new modern one (Figure 2a-c), consequently, the non-existing composite fairy tale animal “species” was “two-legged”, as it is demonstrated now in a new Unicorn illustration based on the results herein (Figure 3b).

3.2 | The megafauna biodiversity and climate or environment indicators

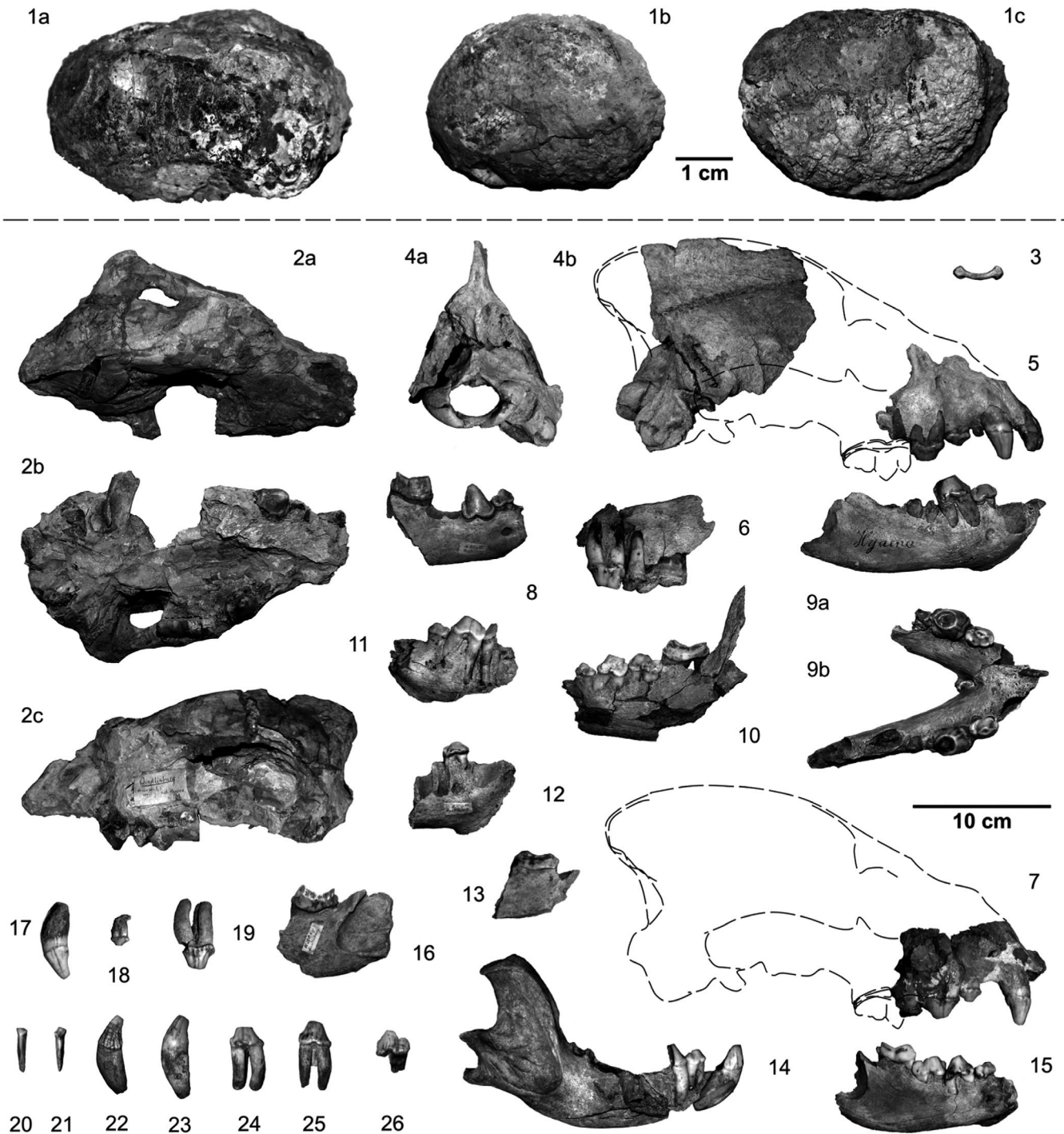
Warm period and most probably from older Eemian layers resulting are the few remains (45 bones = 6% of NISP) of a larger horse *E. f. fossilis*, the bovid *B. primigenius* and roe deer *Capreolus capreolus*. The absence of suidae within the warm fauna indicates open landscape conditions similar as in Neumark-Nord Lake 1 not far from Sewecken-Berge in the same province Saxony-Anhalt, but east of the Harz Mountain (Mania, 2010). Cold period, and from early to middle Weichselian/Wuermian layers obtained, is the fauna of a “mammoth steppe lowland” (Table 19, 512 bones = 66%)

TABLE 19 Vertebrate megafauna ($n = 775$) and NISP amounts of the Upper Pleistocene from the gypsum karst hyena den site Quedlinburg-Sewecken-Berge (Saxony-Anhalt, Germany)

Species	NISP
Carnivore	
<i>Crocota crocota spelaea</i>	115, and one coprolite
<i>Canis lupus cf. spelaeus</i>	79
<i>Panthera leo spelaea</i>	15
<i>Vulpes vulpes</i>	3
<i>Mustela putorius</i>	3
<i>Meles meles</i>	2
Herbivore	
<i>Equus caballus przewalskii</i>	191
<i>Coelodonta antiquitatis</i>	147
<i>Bison priscus</i>	108
<i>Rangifer tarandus</i>	39
<i>Bos primigenius</i>	37
<i>Mammuthus primigenius</i>	16
<i>Equus hemionus hemionus</i>	10
<i>Equus caballus fossilis</i>	6
<i>Megaloceros giganteus</i>	3
<i>Capreolus capreolus</i>	2
<i>Ovibos moschatus</i>	1

sensu Kahlke (1955) or Koenigswald (2002), which includes *M. primigenius*, *C. antiquitatis*, *B. priscus*, *E. f. przewalskii*, *E. h. hemionus*, *M. giganteus* and *R. tarandus* such as the carnivores. Important is the presence of *O. moschatus*, which indicate very cold climate and even periodic taiga conditions (cf. Kahlke, 1955) at least in some time intervals (possibly close to LGM). Large temperate indifferent carnivores are present with *C. c. spelaea*, *C. lupus cf. spelaeus* and *P. l. spelaea* (218 bones = 28%). To those also belong the small carnivores *M. meles*, *V. vulpes*, and *Mustela putorius*, which are

FIGURE 4 Late Pleistocene Ice Age spotted hyena *Crocota crocota spelaea* coprolite and cranial remains from Quedlinburg-Sewecken-Berge. 1. Coprolite (MQ-Sew-1), a. lateral left, b. cranial, c. lateral right. 2. Skull of a late juvenile hyena, late diagenetically deformed (MB no. Ma.30362), a. dorsal, b. ventral, c. lateral. 3. Ceratohyale of a grown-up animal (MLU.IFG no. 2010. Sew-23), dorsal. 4. Braincase fragment of a grown-up animal (MLU.IFG no. 2010. Sew-11), lateral. 5. Right maxillary with I^2-P^3 of a high adult animal (MB no. Ma.29601), lateral. 6. Left maxillary with P^{3-4} of a high adult animal (MLU.IFG no. 2010. Sew-13), lateral. 7. Right maxillary of a high adult animal (MLU.IFG no. 2010. Sew-12), lateral. 8. Right mandible of a late juvenile animal (MB no. Ma.29602), lateral. 9. Mandible of a high adult animal (MB no. Ma.29606) a. lateral, b. dorsal. 10. Left mandible with P_2 to M_1 of a high adult animal (MLU.IFG no. 2010. Sew-17), lateral. 11. Left anterior part of mandible with P_{2-4} of a late adult animal (MLU.IFG no. 2010. Sew-18), lateral. 12. Right anterior part of mandible with P_2 of an adult animal (MB no. Ma.29600), lateral. 13. Left distal part of mandible with M_1 of a late adult animal (MLU.IFG no. 2010. Sew-22), lateral. 14. Right mandible of a high adult animal (MLU.IFG no. 2010. Sew-15), lateral. 15. Right mandible of a high adult animal (MLU.IFG no. 2010. Sew-16), lateral. 16. Left distal part of mandible with M_1 of a high adult animal (MB no. Ma.29599), lateral. 17. Caninus of an adult animal (MB no. Ma.29620), lateral. 18. P^2 of an adult animal (MLU.IFG no. 2010. Sew-31), lateral. 19. P^3 of a high adult animal (MLU.IFG no. 2010. Sew-24), lateral. 20. I_3 of a high adult animal (MLU.IFG no. 2010. Sew-29), labial. 21. I_3 of an adult animal (MB no. Ma.29619.5), lingual. 22. Caninus of an adult animal (MLU.IFG no. 2010. Sew-26), lateral. 23. Caninus of a high adult animal (MLU.IFG no. 2010. Sew-27), lateral. 24. Right P_3 of a high adult animal (MLU.IFG no. 2010. Sew-25), lateral. 25. Left P_3 of a high adult animal (MB no. Ma.29617), labial. 26. Left P_4 of an adult animal (MB no. Ma.29611), labial



typical for a carnivore assemblage of small cavities or burrows in the karstic area, similar as reported from Westeregeln gypsum karst (Diedrich, 2012a, 2013b).

3.3 | Hyena populations, cannibalism, and den types

The hyena bone material from Sewecken-Berge comprises more dominant skull and cranial remains (37%), which

is similar to that reported from modern African (cf. Brain, 1983; Frank, 1994; Boydston et al., 2006; Lam, 1992) and Late Pleistocene (cf. Diedrich, 2008b, 2012d, 2013c, 2014a, 2015; Diedrich, 2014c) European hyena den sites as a result of cannibalism. The cub skull is an individual slightly older in age than the one from the open-air hyena den site at Bad Wildungen (Diedrich, 2006a, 2013c) or Westeregeln (Diedrich, 2012a, 2013b), and Srbsko Chlum-Komin Cave (Diedrich, 2012d) where all cubs there are in milk dentition stage, the skull of Quedlinburg fits with its fully changed teeth

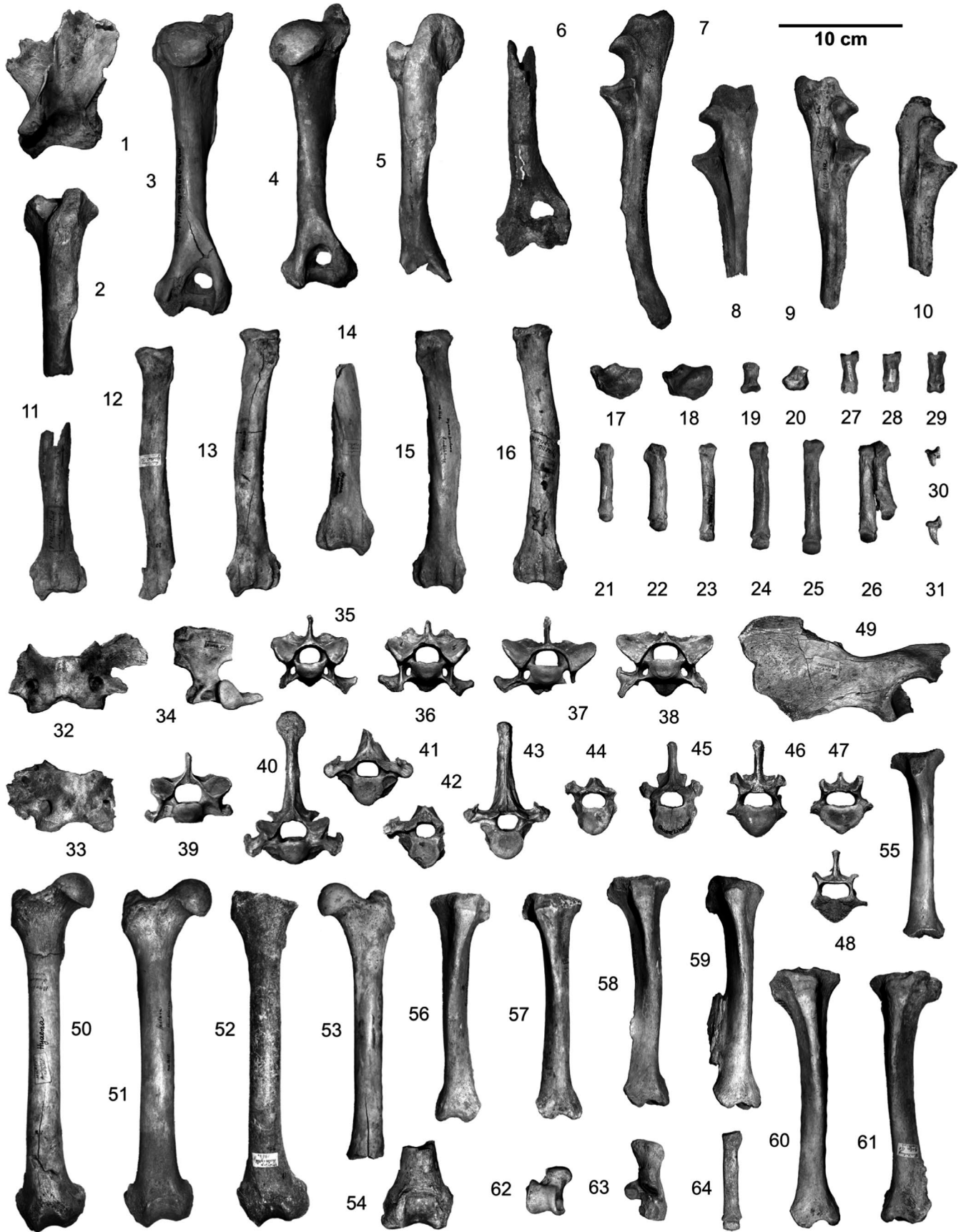


FIGURE 5 Late Pleistocene Ice Age spotted hyena *Crocota crocuta spelaea* forelimb remains from Quedlinburg-Sewecken-Berge. 1. Scapula of an adult animal (MLU.IFG no. 2010. Sew-32), lateral. 2. Incomplete left humerus of an adult animal (Mb no. Ma.29942), cranial. 3. Right humerus (female) of an adult animal (MB no. Ma.29941), caudal. 4. Right humerus (male) of an adult animal (MB no. Ma.29940), caudal. 5. Incomplete left humerus of an adult animal (MLU.IFG no. 2010. Sew-33), cranial. 6. Half left humerus of an adult animal (MLU.IFG no. 2010. Sew-34), cranial. 7. Left ulna (female) of an adult animal (Ma.30359), lateral. 8. Incomplete left ulna of an adult animal (MLU.IFG no. 2010. Sew-38), lateral. 9. Incomplete right ulna of an adult animal (MB no. Ma.29936), lateral. 10. Incomplete right ulna of an early adult animal (MLU.IFG no. 2010. Sew-39), lateral. 11. Left half radius of an adult animal (MLU.IFG no. 2010. Sew-37), lateral. 12. Left incomplete radius of an adult animal (MB no. Ma.29937), lateral. 13. Left radius of an adult animal (MLU.IFG no. 2010. Sew-36), lateral. 14. Right half radius of an adult animal (MB no. Ma.29939), lateral. 15. Right radius of an adult animal (MLU.IFG no. 2010. Sew-35), lateral. 16. Right radius of an adult animal (MB no. Ma.30360), lateral. 17. Left scapholunatum of an adult animal (MLU.IFG no. 2010. Sew-40), dorsal. 18. Left scapholunatum of an adult animal (MLU.IFG no. 2010. Sew-41), dorsal. 19. Right pisiform of an adult animal (MLU.IFG no. 2010. Sew-44), lateral. 20. Left intermedium of an adult animal (MLU.IFG no. 2010. Sew-45), cranial. 21. Right mc V of an adult animal (MB no. Ma.29823a), dorsal. 22. Right mc V (MLU.IFG no. 2010. Sew-46), dorsal. 23. Left mc IV of an adult animal (MB no. Ma.29823b), dorsal. 24. Right mc IV (MLU.IFG no. 2010. Sew-47), dorsal. 25. Left mc III (MLU.IFG no. 2010. Sew-48), dorsal. 26. Left mc IV and V with pathology (exostoses) of a late adult animal (MLU.IFG no. 2010. Sew-43a-b), dorsal. 27. Phalanx I of an adult animal (MB no. Ma.29831), dorsal. 28. Phalanx I of an adult animal (MB no. Ma.29832), dorsal. 29. Phalanx I of an adult animal (MLU.IFG no. 2010. Sew-42), dorsal. 30. Phalanx III of an adult animal (MB no. Ma.29616.1), lateral. 31. Phalanx III (MB no. Ma.29616.2), lateral. 32. Atlas of an adult animal (MLU.IFG no. 2010. Sew-56), dorsal. 33. Atlas of an adult animal (MLU.IFG no. 2010. Sew-57), dorsal. 34. Axes of an adult animal (MLU.IFG no. 2010. Sew-58), lateral. 35. C3 of an adult animal (MLU.IFG no. 2010. Sew-62), cranial. 36. C5 of an adult animal (MLU.IFG no. 2010. Sew-61), cranial. 37. C4 of an adult animal (MLU.IFG no. 2010. Sew-60), cranial. 38. C6 of an adult animal (MLU.IFG no. 2010. Sew-62), cranial. 39. C7 of an adult animal (MB no. Ma.28997), cranial. 40. T1 of an adult animal (MLU.IFG no. 2010. Sew-64), cranial. 41. T3 of an adult animal (MLU.IFG no. 2010. Sew-65), cranial. 42. T, middle, of an adult animal (MLU.IFG no. 2010. Sew-67), cranial. 43. T4 of an adult animal (MLU.IFG no. 2010. Sew-66), cranial. 44. T, middle, of an adult animal (MLU.IFG no. 2010. Sew-68), cranial. 45. T15 of an adult animal (MB no. Ma.29821), cranial. 46. L3 of an adult animal (MLU.IFG no. 2010. Sew-70), cranial. 47. L5 of an adult animal (MLU.IFG no. 2010. Sew-71), cranial. 48. L, middle, of a cub (MLU.IFG no. 2010. Sew-69), cranial. 49. Left pelvic coxa (MB no. Ma.30357), lateral. 50. Right femur of an adult animal (MB no. Ma.29948), cranial. 51. Right femur of an adult animal (MLU.IFG no. 2010. Sew-50), cranial. 52. Right incomplete femur of an adult animal (MB no. Ma.29935), cranial. 53. Left incomplete femur of an adult animal (MLU.IFG no. 2010. Sew-51), cranial. 54. Left distal femur of an adult animal (MLU.IFG no. 2010. Sew-52), cranial. 55. Right tibia shaft of a juvenile animal (MLU.IFG no. 2010. Sew-56), cranial. 56. Left tibia of an adult animal (MB no. Ma.29944), cranial. 57. Right tibia of an adult animal (MB no. Ma.29946), cranial. 58. Right tibia (pathology) of a late adult animal (MB no. Ma.303061), cranial. 59. Right tibia (pathology) of a late adult animal (MLU.IFG no. 2010. Sew-54), cranial. 60. Right tibia of an adult animal (MB no. Ma.29945), cranial. 61. Left tibia of a late adult animal (MB no. Ma.29943), cranial. 62. Left astragalus of an adult animal (MLU.IFG no. 2010. Sew-55), dorsal. 63. Left calcaneus of an adult animal (MB no. Ma.29836), cranial. 64. Left mt III of an adult animal (MLU.IFG no. 2010. Sew-49), dorsal

in similar age to a late juvenile–early adult best to one figured from the Perick Caves (Diedrich, 2005a). The incomplete and fragmentary adult cranial material from Quedlinburg cannot be compared well for the sex identifications to several other more or less complete Late Pleistocene hyena crania from across Europe (Germany, Czech Republic, Romania; Diedrich, 2011g, Diedrich, 2014c). The hyena population from the Sewecken-Berge consists of cubs (2%), early adults (4%) and adult to late adult individuals (94%), which is very similar to the Westeregeln open-air gypsum karst commuting den site (Figure 19a). The scarcity of cub and early adult remains excludes the likelihood of an exclusive birth den site (cf. Modern: Cooper, 1993; East et al., 1989; Mills & Mills, 1977; White, 2008, Pleistocene: Diedrich, 2011b, 2014c) at Sewecken-Berge. Other open-air hyena den sites are at this stage identified as both, birth and commuting overlapping den sites, as have been documented at Bad Wildungen and Bottrop (Diedrich, 2011b, 2013c), or herein also Saalfeld-Roter Berg in Germany (Figure 19a). The quite large quantities of material from adult to late adult individuals at Sewecken-Berge seem to be the result of hyena cannibalism, as has been reported in modern African spotted hyenas which leave mainly

cranial and long bone remains (Lam, 1992; Frank, 1994). Such cannibalism explains the high NISP percentage of *C. c. spelaea* at their den sites in general (cf. Diedrich, 2005a, 2006a, 2008a, 2010a, 2011c, 2011d, 2011e, 2011g, 2011h, 2011i, 2012a, 2012d, 2013c, 2014c, 2015; Ehrenberg et al., 1938; Musil, 1962; Tournepiche & Couture, 1999). The large quantity of hyena bones, which are sometimes damaged, demonstrates a well-frequented open-air “commuting den type” at Sewecken-Berge compared to other den type sites in open-air positions of northern Germany (Figure 19a). By comparison with the variable quantity of hyena remains found at modern African hyena den sites (Lam, 1992; Lansing et al., 2007; Pokines and Peterhans, 2007), the Sewecken-Berge hill must have been used by many hyena generations over several thousands of years during early to middle Late Pleistocene repeatedly. This can be estimated with modern African spotted hyena clans that are made up of between 25 and 80 individuals depending on the presence/absence of prey and the size of the den type (cf. Hofer & East, 1995). Generally at den types, about only a few bones accumulate per year (cf. modern in Lam, 1992; Boydston et al., 2006). Finally, typically hyenas – modern and Pleistocene – marked their den area by faecal

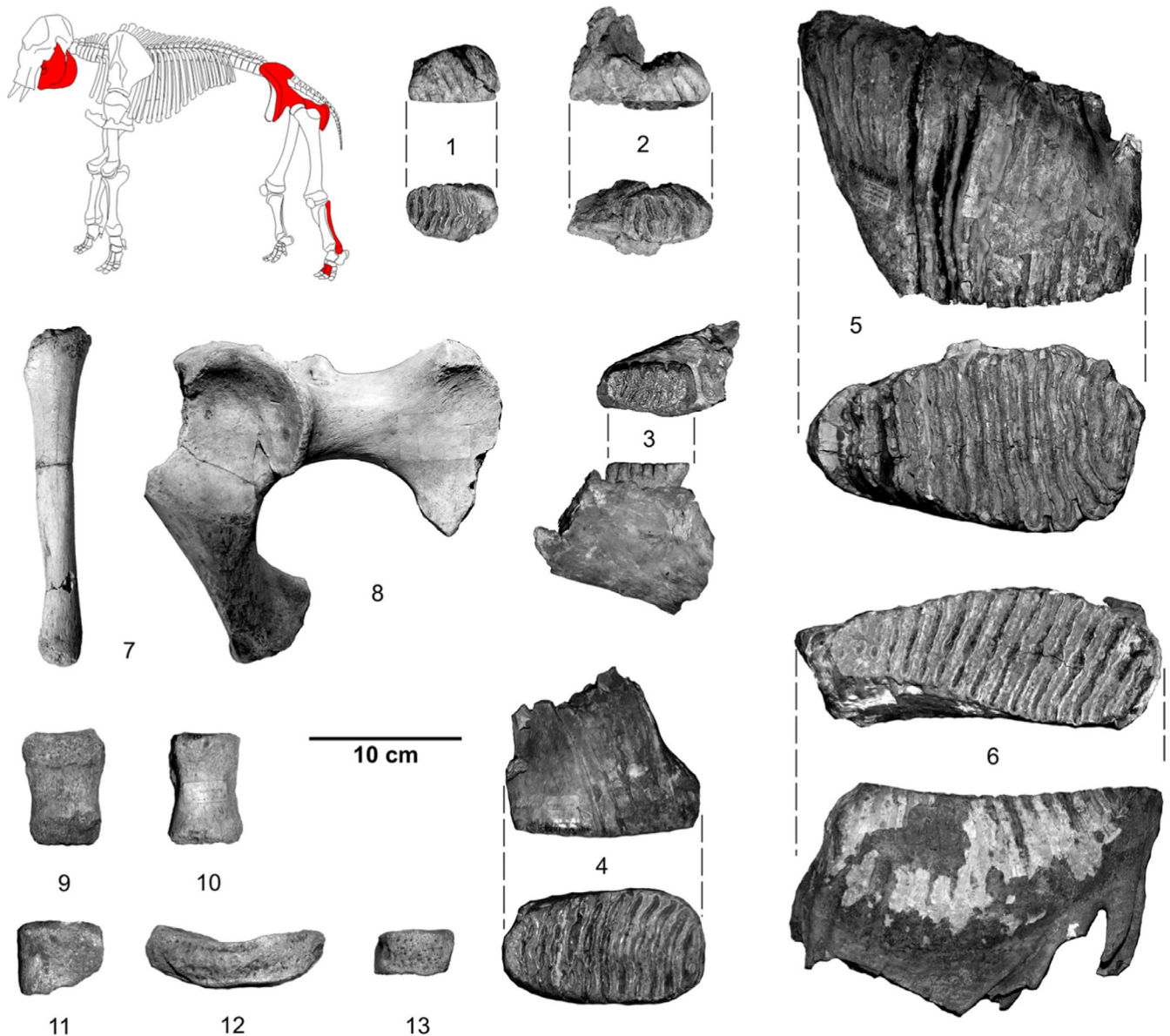


FIGURE 6 Late Pleistocene woolly mammoth *Mammuthus primigenius* calf and early adult elephant remains from Quedlinburg-Sewecken-Berge. Several remains might belong to a single small calf. Other remains are teeth or pedal bones. 1. Right M^2 of a very juvenile calf skull (MLU. IFG no. 2010. Sew-180a), lateral and occlusal. 2. Left M^2 and maxillary fragment of a very juvenile calf skull (MLU. IFG no. 2010. Sew-180b), lateral and occlusal. 3. Lower jaw fragment with tooth (MLU. IFG no. 2010. Sew-174), lateral and occlusal. 4. Right M^1 (MB no. Ma.14840), lateral and occlusal. 5. Right M^2 (MB no. Ma.14836), lateral and occlusal. 6. Left M_2 (MQ no. Quedl-Sew-2), lateral and occlusal. 7. Fibula shaft of a calf (MLU. IFG no. 2010. Sew-175), lateral. 8. Left coxa of a calf (MLU. IFG no. 2010. Sew-176), lateral. 9. Metatarsus of a calf (MB no. Ma.17085), dorsal. 10. Metatarsus of a calf (MB no. Ma.17086), dorsal. 11. Half metatarsus of a calf (MB no. Ma.17087), dorsal. 12. Right naviculare (MB no. Ma.17089), cranial. 13. Right tarsal II (MB no. Ma.17091), cranial

pellets (Diedrich, 2010d, 2012b, 2014a), whereas only a single typically large and hyena shaped coprolite survived in one collection (Figure 4.1).

3.4 | Hyena versus human prey bone accumulations, and bone taphonomy

About 27% of the megafauna remains from Quedlinburg-Sewecken-Berge are from large carnivores (lions, hyenas or

wolves: NISP = 208, Figure 19b). This excludes a “human bone accumulation” origin, since humans usually hunted non-herbivorous during the Middle Palaeolithic resulting in few carnivore bone percentages at their camp sites (e.g. Aldhouse-Green et al., 1995; Fosse et al., 1998; Kuhn et al., 2008; Lansing et al., 2007; Pickering, 2002; Villa et al., 2004). The remains of these large carnivores at Quedlinburg are similar as in Westeregeln dominated by hyena remains (Figure 19b), which is typical of most Late Pleistocene hyena den sites (e.g. Diedrich, 2005a, 2006a, 2

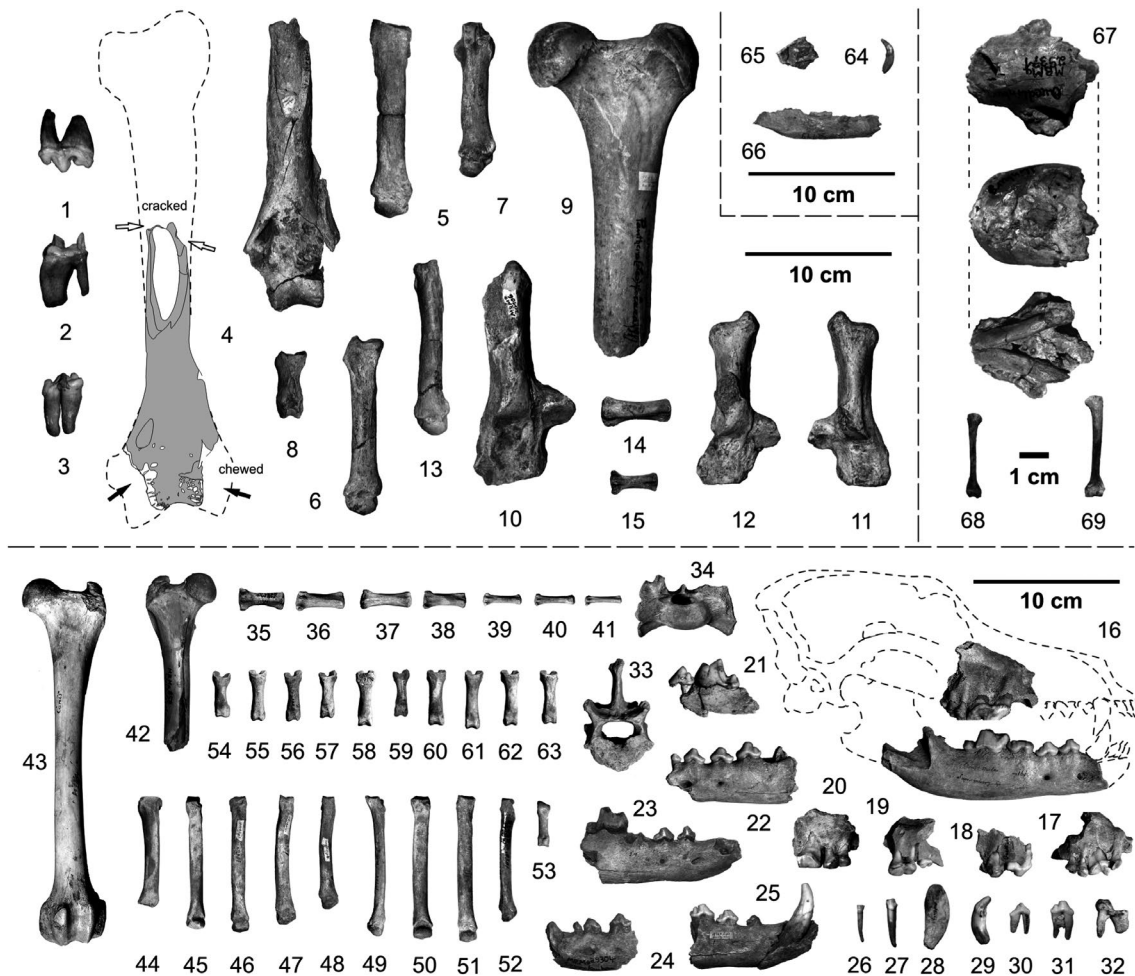


FIGURE 7 Late Pleistocene carnivore remains from Quedlinburg-Sewecken-Berge. 1–15. *Panthera leo spelaea*: 1. Left P^4 (MB no. Ma.30069), labial. 2. Right M_1 (MB no. Ma.29598), labial. 3. Right P_4 (MB no. Ma.29597), labial. 4. Left cracked humerus shaft of a cub (MLU.IFG no. 2010. Sew-1), cranial. 5. Right mtIII (MLU.IFG no. 2010. Sew-5), dorsal. 6. Left mc III (MLU.IFG no. 2010. Sew-3), dorsal. 7. Left mcV (MLU.IFG no. 2010. Sew-2), dorsal. 8. Phalanx I (MLU.IFG no. 2010. Sew-4), dorsal. 9. Left half femur (MB no. Ma.30104), cranial. 10. Right calcaneus (MB no. Ma.30106), cranial. 11. Left calcaneus (MLU.IFG no. 2010. Sew-9), cranial. 12. Right calcaneus (MLU.IFG no. 2010. Sew-8), cranial. 13. Left mtIII (MLU.IFG no. 2010. Sew-5), dorsal. 14. Caudal vertebra (MLU.IFG no. 2010. Sew-6), dorsal. 15. Caudal vertebra (MLU.IFG no. 2010. Sew-7), dorsal. 16–63. *Canis lupus cf. spelaeus*: 16. Right maxillary (2010. Sew-181) and right mandible (MLU.IFG no. 2010. Sew-197) of a high adult animal, lateral. 17. Right maxillary fragment (MLU.IFG no. 2010. Sew-182), cranial. 18. Right maxillary fragment (MLU.IFG no. 2010. Sew-185), cranial. 19. Left maxillary fragment (MLU.IFG no. 2010. Sew-184), cranial. 20. Left maxillary fragment (MLU.IFG no. 2010. Sew-123), cranial. 21. Left mandible fragment of an early adult animal (MLU.IFG no. 2010. Sew-202), cranial. 22. Left mandible (MLU.IFG no. 2010. Sew-195), lateral. 23. Right mandible (MB no. Ma.29036), lateral. 24. Half left mandible (MB no. Ma.29304), lateral. 25. Right mandible (MB no. Ma.28967), lateral. 26. I_2 (MLU.IFG no. 2010. Sew-194), labial. 27. I_3 (MLU.IFG no. 2010. Sew-193), labial. 28. Caninus of a late adult animal (MLU.IFG no. 2010. Sew-188), lateral. 29. Right I^3 (MLU.IFG no. 2010. Sew-186), labial. 30. P_2 (MLU.IFG no. 2010. Sew-192), labial. 31. P_4 (MLU.IFG no. 2010. Sew-191), labial. 32. Right M^2 (MLU.IFG no. 2010. Sew-187), cranial. 33. Lumbar vertebra (MLU.IFG no. 2010. Sew-201), cranial. 34. Sacrum (MLU.IFG no. 2010. Sew-200), cranial. 35–41. Caudal vertebrae (MB no. Ma.29834, MLU.IFG no. 2010. Sew-204, 203, 212, 214, 213, 205), lateral. 42. Half right femur (MB no. Ma.858), cranial. 43. Left femur (MLU.IFG no. 2010. Sew-198), cranial. 44. Right Mc V of a juvenile (MLU.IFG no. 2010. Sew-219), cranial. 45. Right McIV (MLU.IFG no. 2010. Sew-220), cranial. 46. Right McIII (MB no. Ma.29828), cranial. 47. Right Mc II of a female (MB no. Ma.29830), cranial. 48. Right Mc II of a male (MB no. Ma.29829), cranial. 49. Right Mt V (MLU.IFG no. 2010. Sew-223), cranial. 50. Right McIII (MLU.IFG no. 2010. Sew-201), cranial. 51. Left MtIII (MLU.IFG no. 2010. Sew-255), cranial. 52. Right Mt II (MB no. Ma.29038), cranial. 53. Right McI (MLU.IFG no. 2010. Sew-222), cranial. 54–63. Phalanx I (MLU.IFG no. 2010. Sew-227–235, Ma.29833), dorsal. 64. *Vulpes vulpes* caninus (MB no. Ma.29037.5), labial. 65–66. *Meles meles*: 65. Right maxillary (MB no. Ma.29410), ventral. 66. Left mandible (MB no. Ma.29410), lateral. 67–68. *Mustela putorius*: 67. Anterior skull with lower jaw (MB no. Ma.29371), dorsal, lateral, ventral. 68. Right humerus of a female (MB no. Ma.29371a), cranial. 69. Left humerus of a male (MB no. Ma.29371b), cranial

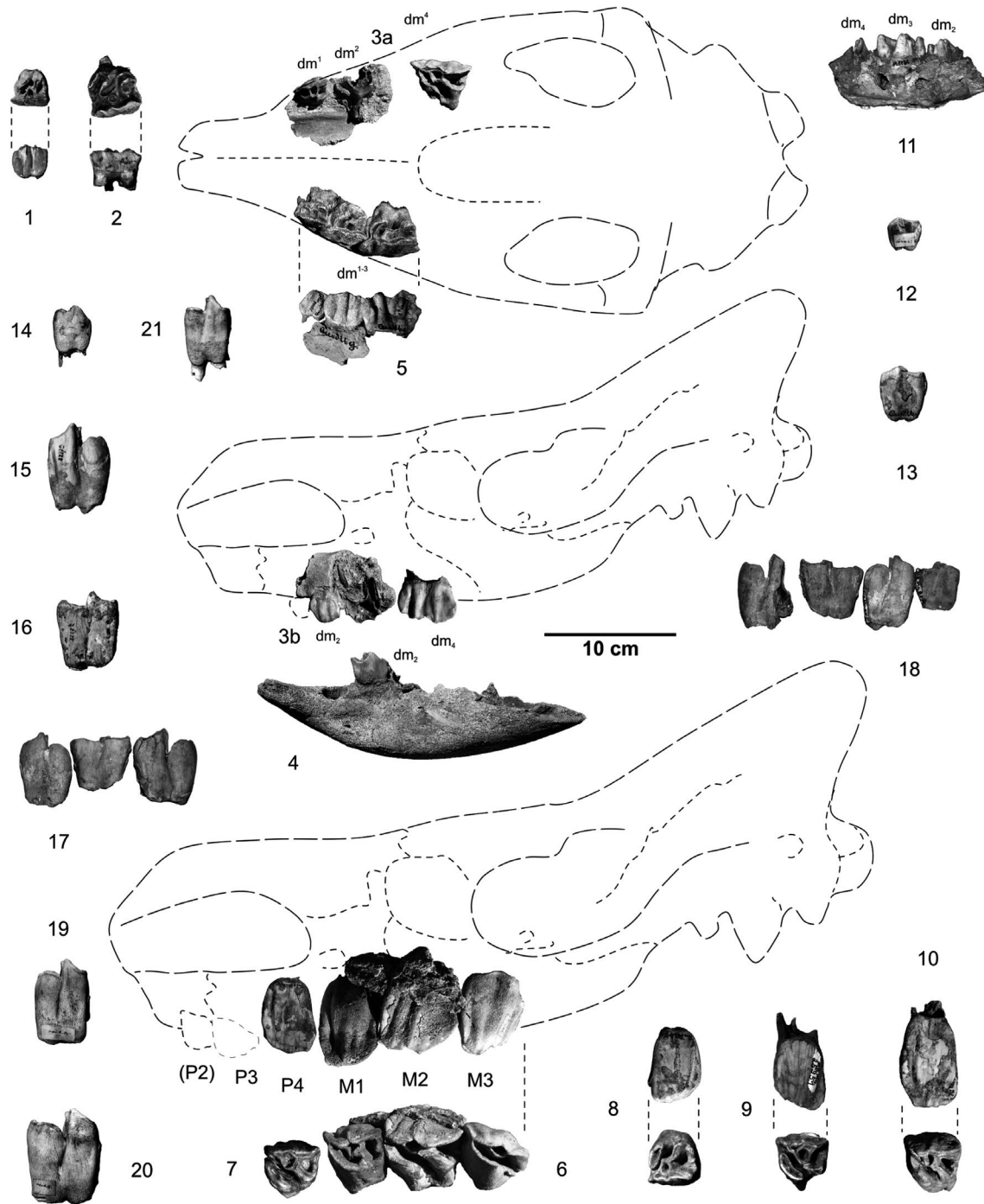


FIGURE 8 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* calf and early adult cranial remains from Quedlinburg-Sewecken-Berge (including originals of Giebel, 1851). 1. Dm^2 (MLU.IFG no. 2010. Sew-172), occlusal and lateral. 2. Dm^4 (MB no. Ma.25843), lateral and occlusal. 3. Maxillary (MLU.IFG no. 2010. Sew-173), occlusal and lateral. 4. Mandible (MLU.IFG no. 2010. Sew-132), lateral. 5. Maxillary (MLU.IFG no. 2010. Sew-171), occlusal and lateral. 6. M^{1-3} (MLU.IFG no. 2010. Sew-162), lateral and occlusal. 7. P^4 (MLU.IFG no. 2010. Sew-166), lateral and occlusal. 8. P^3 (MLU.IFG no. 2010. Sew-163), lateral and occlusal. 9. P^4 (MB no. Ma.25951), lateral and occlusal. 10. P^4 (MLU.IFG no. 2010. Sew-164), lateral and occlusal. 11. Mandible fragment (GMB no. M.1731), inner lateral view. 12. P_2 (MLU.IFG no. 2010. Sew-136), lateral. 13. P_3 (MLU.IFG no. 2010. Sew-139), occlusal and lateral. 14. P_2 (MLU.IFG no. 2010. Sew-135), lateral. 15. M_3 (MLU.IFG no. 2010. Sew-143), lateral. 16. M_3 (MLU.IFG no. 2010. Sew-133), lateral. 17. Left P^4 - M^2 (MB no. Ma.855a), lateral. 18. Right P^3 - M^2 (MB no. Ma.855b), lateral. 19. P_4 (MLU.IFG no. 2010. Sew-142), lateral. 20. M_3 (MLU.IFG no. 2010. Sew-144), lateral. 21. P_3 (MLU.IFG no. 2010. Sew-137), lateral

008a,2010a,2011d,2011e,2012a,2012d,2014c; Diedrich, 2007a,b, 2011g, h, i; Fosse et al., 1998; Musil, 1962; Villa et al., 2004). In addition, a large proportion of the prey bones identified herein fit into the pattern of hyena dens and especially to prey storage or commuting den situations that have been described also for modern spotted hyenas in Africa (cf. Henschel et al., 1979; Kruuk, 1972; Scott & Klein, 1981; Skinner et al., 1986; Sutcliffe, 1970). Such a hyena clan could have easily accumulated the large quantity of prey bones scattered all over the commuting and/or prey storage in the dolines den area, mainly by importing their carcass pieces (mainly legs or skulls) for further feeding and final bone crushing (Diedrich, 2005b-e). Similar habits of prey import to the den have been described for modern African spotted hyenas (e.g. Brain, 1980; Lam, 1992) in order to protect it from other predators (in this fossil record case, the steppe lions, and other hyenas, and wolf packs), and as food for the adolescents. Hyenas at the Sewecken-Berge may also have imported individual bones in order to store them, which modern African hyenas occasionally do (cf. Brain, 1980; Skinner et al., 1986), but the bones found at Sewecken-Berge mainly represent articulated body parts from hunted Ice Age animals, especially in the case of horses and mammoth or rhinoceros calves.

3.5 | Mammoth scavengers and calf hunters

At hyena den sites (commuting den sites), the mammoth remains are generally strongly fragmented and on the joints chewed such as demonstrated for the Perick Caves or Balve Cave (Diedrich, 2005d, Diedrich, 2011f), whereas hyenas sometimes fed on elephant carcasses over several days or weeks (White and Diedrich, 2012; Diedrich, 2014b). Also typical at most hyena dens are calf remains, found at Sewecken-Berge, of pedal bones and skull remains mainly in form of isolated teeth. Similar as in horse skulls, hyenas were able to crush the light-constructed skulls simply into pieces. Only the molar teeth, including from the lower jaws, are typically found at dens, but also here, mostly of younger elephants. As demonstrated now well on modern (White and Diedrich, 2012), and fossil Late Pleistocene elephant carcasses of Neumark-Nord Lake 1 (Diedrich, 2010c, 2012c, 2014b), the feeding and carcass dismembering technique of Ice Age spotted hyenas (*C. c. spelaea*) and modern spotted hyenas (*C. c. crocuta*) is similar. Late Pleistocene and Modern spotted hyenas generally start with eating the carcass from inside (intestines and inner organs), and they also start with the feet, leaving the rest of the carcasses uneaten in the landscape (White and Diedrich, 2012). At further destruction stages, hyenas dislocate the pedal skeletons, then parts of the legs, but were only able only to dismember and transport calf and early adults legs, which were too heavy for

far distance transport to the den (Diedrich, 2012c, 2014b). The hyena den situation and few remains fit again to the contra-argument of “used elephant bones” for the Unicorn “holotype” skeleton. The Unicorn “horn” seem to have been a Pleistocene elephant tusk, but such as known from other hyena den sites (e.g. Westeregeln: Diedrich, 2012a), tusks are extremely rare, because normally those are not imported by the carnivores, except indirectly, if still in the alveolus of the skulls, which latter were rarely moved to the dens.. Also, vertebral column remains are rare at hyena den sites, and generally only few vertebra centra survived, but not complete ones with dorsal spines. For those are chewed in the vertebral column first around the shoulder blade (Diedrich, 2014b), the Unicorn “holotype” skeleton middle vertebral column cannot have been made from an elephant vertebral column as suggested by Rust (2002), and also the centra are much thinner, as being illustrated historically. However, elephants also do not contribute too much in the bone NISP at all studied hyena den cave and open-air sites (2%–10%), whereas to those decreasing in frequency to the mountain regions (Figure 19), where hyenas specialized on cave bear feeding resulting from the absence/scarcity of elephants and other mammoth steppe megafauna (Diedrich, 2011b).

3.6 | Hyenas as hunters of and scavengers on woolly rhinoceroses

The large quantities of woolly rhinoceros bone remains at the Sewecken-Berge site (Figure 19b) must be explained in terms of taphonomy, predator selection and bone damage, as has been previously discussed for other hyena open-air bone accumulation sites at Bottrop (Diedrich, 2011b), Bad Wildungen (Diedrich, 2013c) or Westeregeln (Diedrich, 2012a), and caves sites such as Perick Caves (Diedrich, 2008a), Koněprusy Cave or Srbsko Chlum-Komín Cave (Diedrich 2011h) where always similar repeatedly identical damaged bones have been figured, which are classified now in three bone damage stages for the long bones (Diedrich, 2011b). Similarly damaged rhinoceros long bones have also been illustrated from other open-air sites in Austria, Germany and the Czech Republic (Diedrich, 2006b, 2008a,2010c,2011e,2012a,2012d,2015; Diedrich & Žák, 2006; Ehrenberg et al., 1938; Liebe, 1876; Musil, 1962; Thenius, 1961; Wernert, 1968; Zapfe, 1939).

In general, spotted hyenas caused bite marks best preserved at rhinoceros bones also visible in the material from Sewecken-Berge (Figure 14), which appear as triangular, oval and elongated scratch marks. Those bite marks and damage types (mainly stage 2, of three) are similar to those from various other late Pleistocene hyena den sites (e.g., Diedrich, 2006b,2008a,2011c,2012a,2012d,2013c,2015; Diedrich, 2008c, 2011h; Diedrich & Žák, 2006) and to

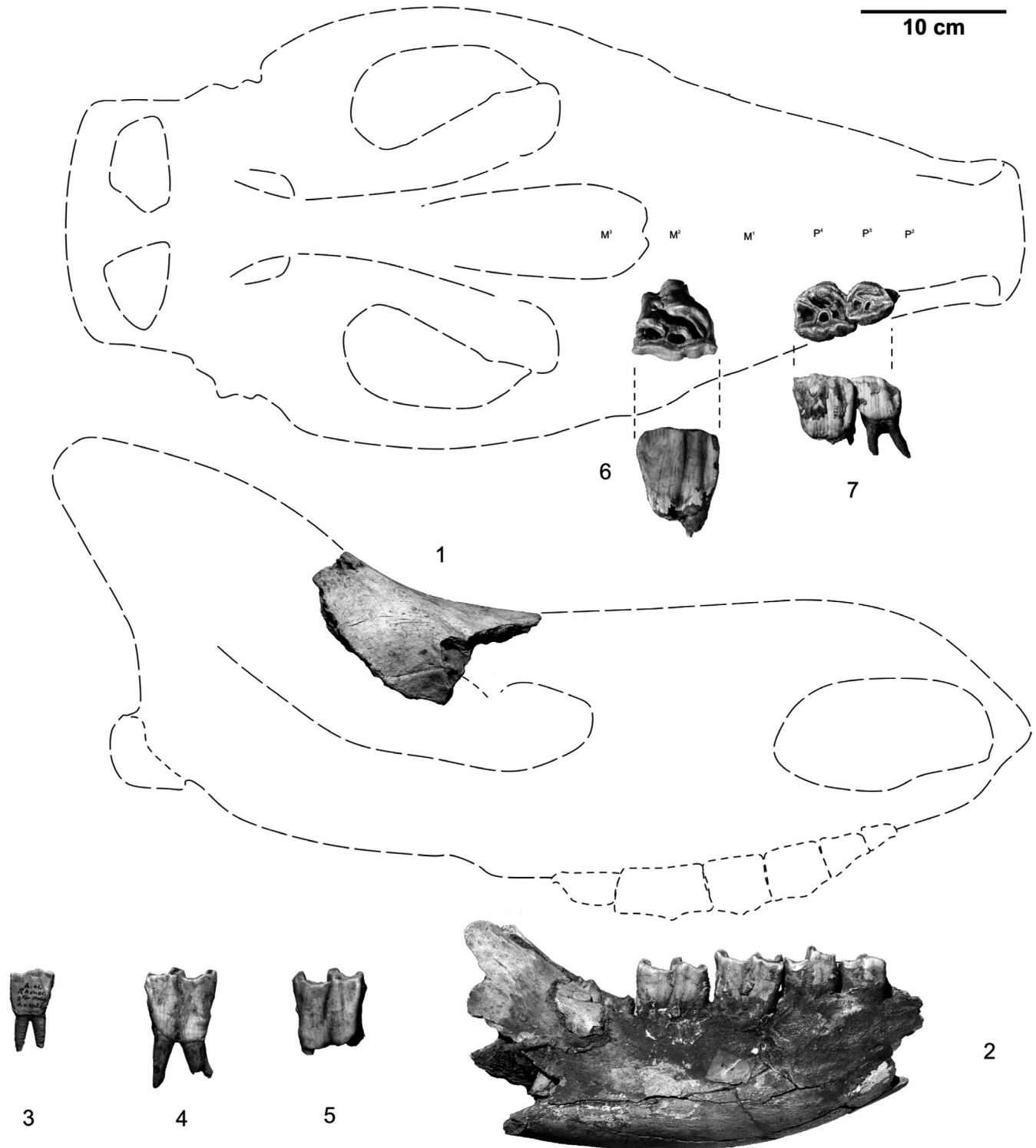


FIGURE 9 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* adult animal cranial remains from Quedlinburg-Sewecken-Berge (including originals of Giebel, 1851). 1. Frontal (MLU.IFG no. 2010. Sew-127), lateral. 2. Mandible (MLU.IFG no. 2010. Sew-129), lateral. 3. P₃ (MLU.IFG no. 2010. Sew-140), lateral. 4. M₂ (MLU.IFG no. 2010. Sew-132), lateral. 5. M₃ (MLU.IFG no. 2010. Sew-143), lateral. 6. M² (MLU.IFG no. 2010. Sew-152), occlusal and lateral. 7. P²⁻³ (MLU.IFG no. 2010. Sew-160), occlusal and lateral

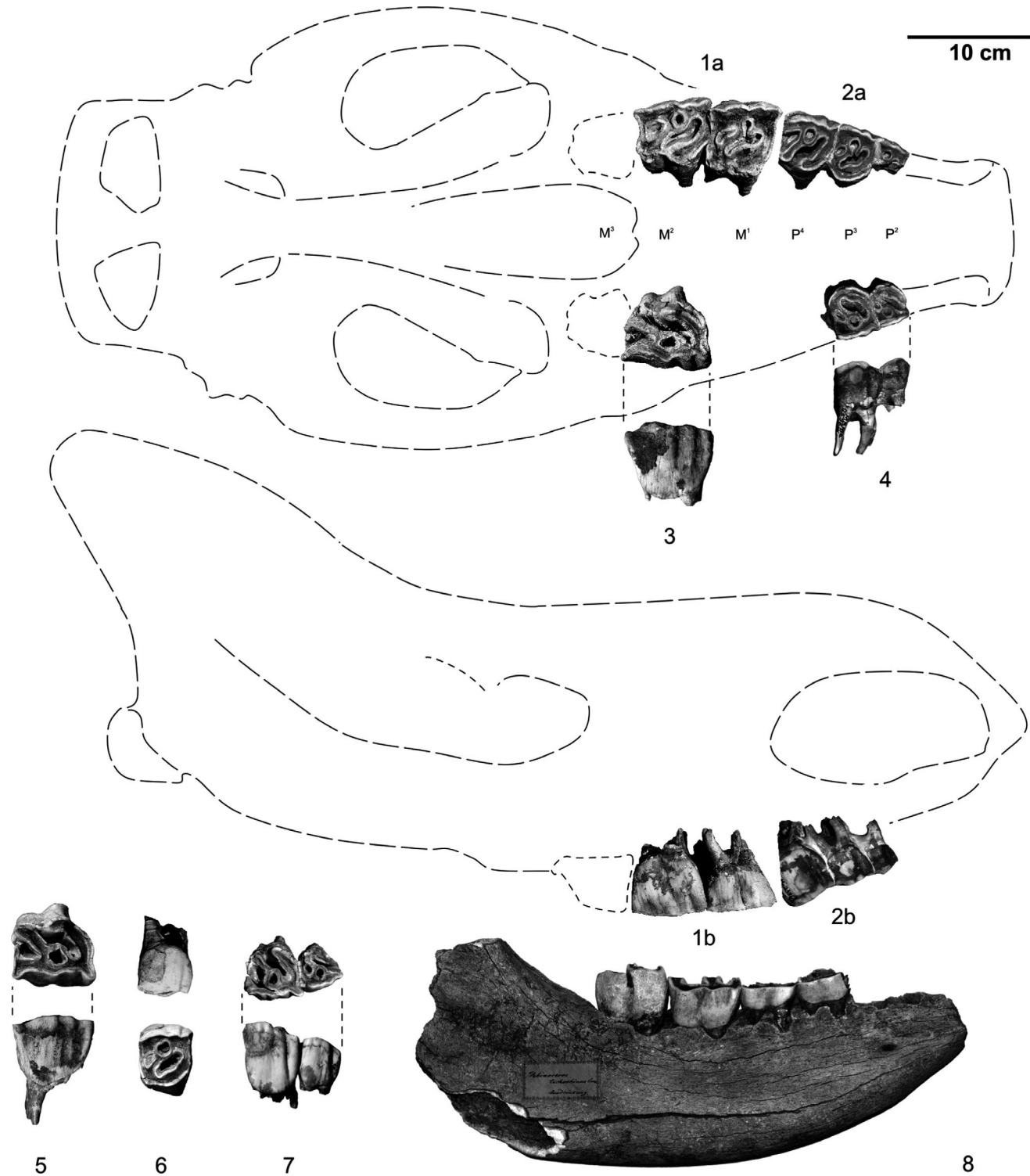


FIGURE 10 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* high adult animal cranial remains from Quedlinburg-Sewecken-Berge (including originals of Giebel, 1851). 1. M^{1-2} (MLU.IFG no. 2010. Sew-150), lateral and occlusal. 2. P^{1-3} (MB no. Ma.25961), lateral and occlusal. 3. M^2 (MLU.IFG no. 2010. Sew-153), lateral and occlusal. 4. P^{2-3} (MB no. Ma.25962), lateral and occlusal. 5. M^2 (MLU.IFG no. 2010. Sew-155), lateral and occlusal. 6. P^4 (MLU.IFG no. 2010. Sew-159), lateral and occlusal. 7. P^{2-3} (MLU.IFG no. 2010. Sew-161), lateral and occlusal. 8. Right mandible (MQ no. Qued-Sew-3)

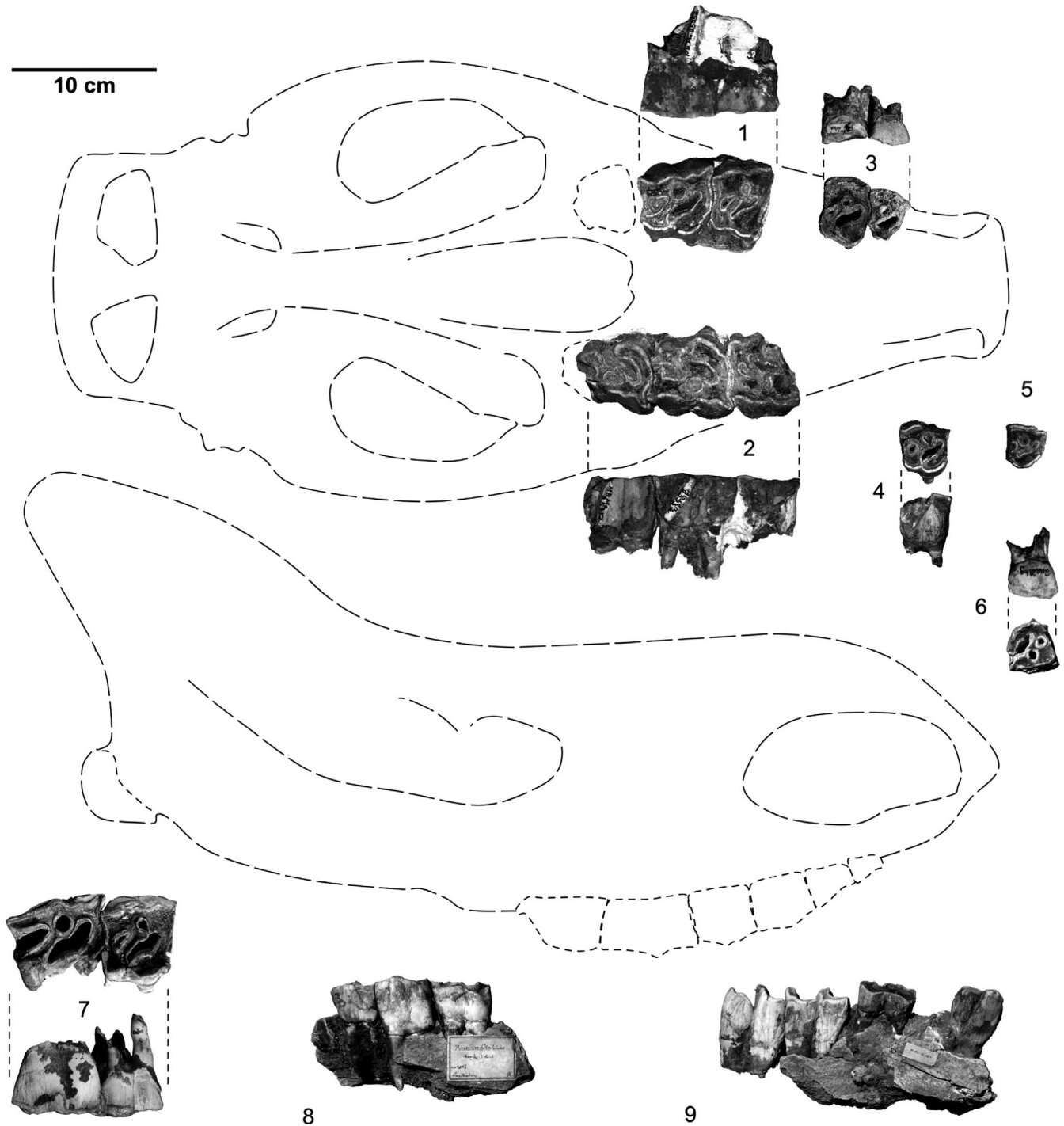


FIGURE 11 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* late adult animal cranial remains from Quedlinburg-Sewecken-Berge (including originals of Giebel, 1851). 1–2. Left M^{1-2} and right M^{1-3} (MB no. Ma.25952), lateral and occlusal. 3. P^{2-3} (MLU.IFG no. 2010. Sew-167/189), occlusal and lateral. 4. P^3 (MB. no. Ma.25951b), occlusal and lateral. 5. P^2 (MB. no. Ma.25951a), occlusal and lateral. 6. P^2 (MLU.IFG no. 2010. Sew-170), lateral and occlusal. 7. M^{1-2} (MLU.IFG no. 2010. Sew-149), occlusal and lateral. 8. Mandible fragment (MLU.IFG no. 2010. Sew-130), lateral. 9. Mandible fragment (MLU.IFG no. 2010. Sew-131), lateral

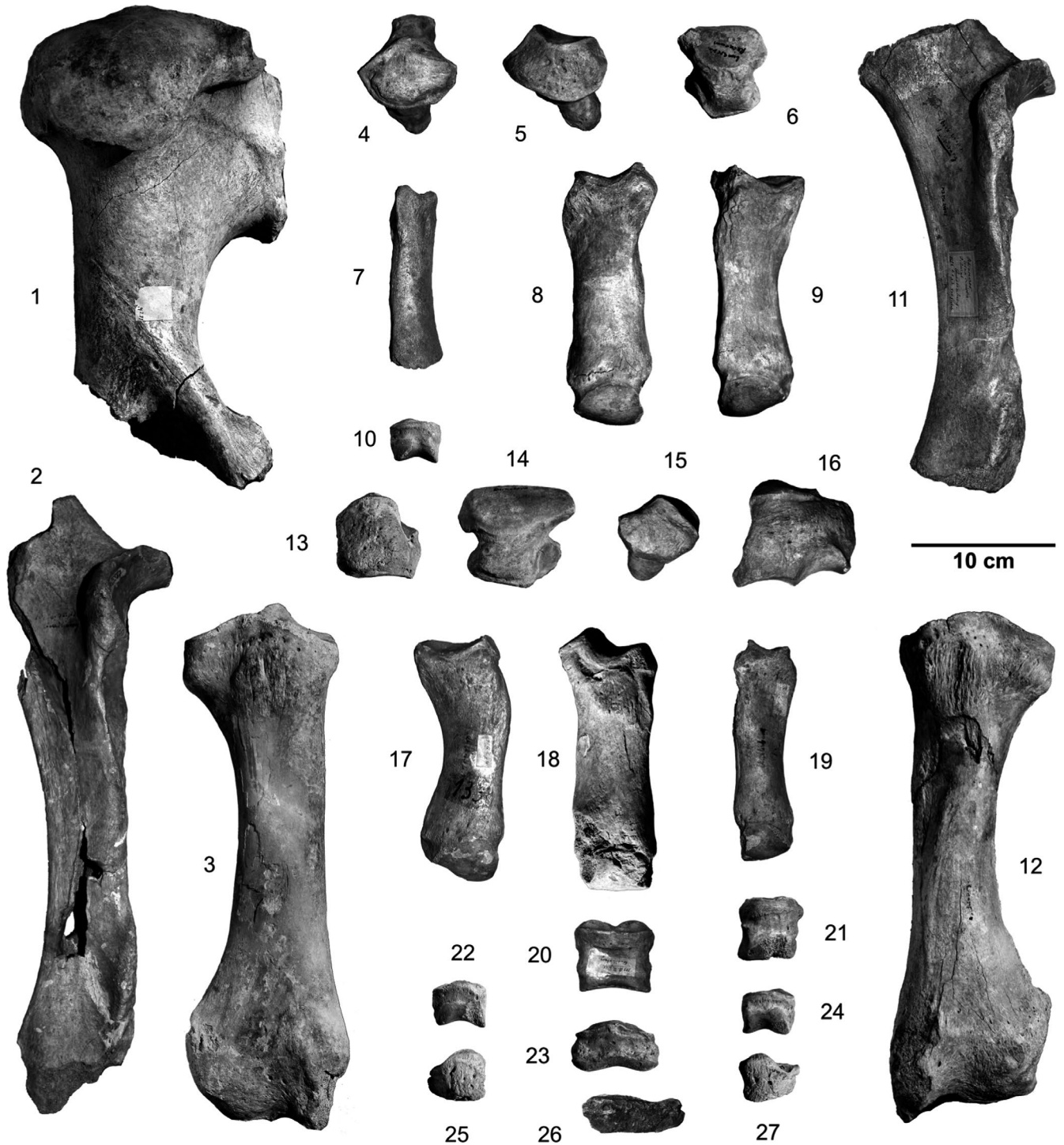


FIGURE 12 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* forelimb remains from Quedlinburg-Sewecken-Berge. 1. Right incomplete humerus (MLU.IFG no. 2010. Sew-84), caudal. 2. Left ulna (MB no. Ma.25587), cranial. 3. Right radius (MLU.IFG no. 2010. Sew-122), cranial. 4. Right carpale III (MB no. Ma.2572), cranial. 5. Left carpale IV/V (MB no. Ma.25723), cranial. 6. Right intermedium (MLU.IFG no. 2010. Sew-112), cranial. 7. Left mc of a calf (MQ-Sew-6), dorsal. 8. Left Mc II (MB no. Ma.1753), dorsal. 9. Right Mc IV (MB no. Ma.1752), cranial. 10. Phalanx II (MLU.IFG no. 2010. Sew-102), cranial. 11. Left ulna of an adolescent animal (MB no. Ma.24975), cranial. 12. Left radius (MLU.IFG no. 2010. Sew-121), cranial. 13. Left ulnare (MLU.IFG no. 2010. Sew-111), cranial. 14. Right intermedium (MLU.IFG no. 2010. Sew-113), cranial. 15. Left carpale III (MB no. Ma.25729), cranial. 16. Right radiale (MB no. Ma.25722), lateral. 17. Left Mc IV (MB no. Ma.25605), cranial. 18. Left Mc III (MLU.IFG no. 2010. Sew-76), cranial. 19. Left Mc II (MB no. Ma.25604), cranial. 20. Phalanx I (MB no. Ma.25676), dorsal. 21. Phalanx II (MLU.IFG no. 2010. Sew-101), cranial. 22. Phalanx II (MLU.IFG no. 2010. Sew-105), cranial. 23. Phalanx II (MLU.IFG no. 2010. Sew-104), cranial. 24. Phalanx II (MLU.IFG no. 2010. Sew-97), cranial. 25. Phalanx III (MLU.IFG no. 2010. Sew-94), cranial. 26. Phalanx III (MB no. Ma.25674), dorsal. 27. Phalanx III (MLU.IFG no. 2010. Sew-96), cranial

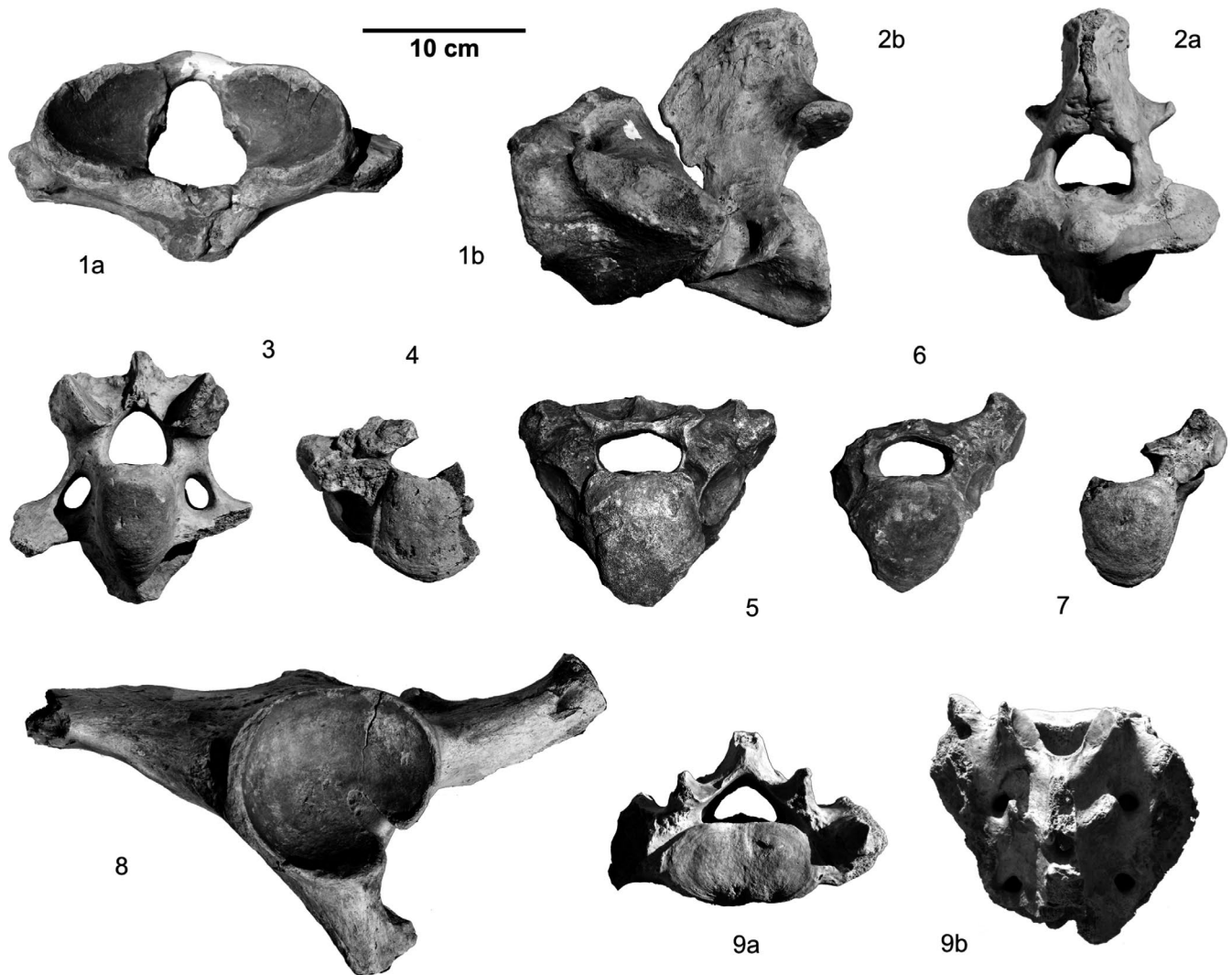


FIGURE 13 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* axial skeleton remains from Queudlinburg-Sewecken-Berge. 1. Atlas (MLU.IFG no. 2010. Sew-114), cranial. 2. Axis (MLU.IFG no. 2010. Sew-115), cranial. 3. Middle C (MLU.IFG no. 2010. Sew-116), cranial. 4. T3 (MLU.IFG no. 2010. Sew-117), cranial. 5. T2 (MB no. Ma.24923), cranial. 6. Middle T (MB no. Ma.24925), cranial. 7. Middle T (MLU.IFG no. 2010. Sew-118), cranial. 8. Left coxa (MLU.IFG no. 2010. Sew-128), cranial. 9. Sacrum (MLU.IFG no. 2010. Sew-74), cranial

those at modern damaged bones (e.g. Faith, 2007; Hill, 1989; Pokines & Peterhans, 2007). The damage stage 2 is mainly reached only at the Sewecken-Berge, and this correlates with prey storage and commuting sites, rather than to birth dens where bone was further damaged by hyena cubs finally to shafts only (damage stage 3), or fragments to “nibbling sticks” (cf. Diedrich & Žák, 2006).

The proportion of the woolly rhinoceros remains in the Sewecken-Berge material that are from calves (11%) is medium high (Figure 14b) which is found at the closely situated site Westeregeln hyena den a higher percentage (22%, Diedrich, 2012a). Even higher calf percentages have been reported from some of the German and Czech hyena den cave sites (Diedrich, 2006b, Diedrich, 2008c, Diedrich, 2011c; Diedrich & Žák, 2006). These results possibly of hyena clans specifically target *C. antiquitatis* calves in hunts, whereas adults

were consumed only postmortally. While such hunting tactics must remain purely speculative for the Ice Age, the targeting of smaller and younger prey in migrating big game is well known among present-day hyenas (Cooper, 2008; Kruuk, 1972).

3.7 | The horse and donkey species at Sewecken-Berge

Following the nomenclature of Zessin et al., (2009), but excluding their subgenus names, there are three equids in the Sewecken-Berge material. The identification and separation of those are possible, especially on the proportions of the metapods, but in general, all three are different large: (a) *E. f. fossilis* (large horse), (b) *E. f. przewalskii* (small horse) and c. *E. h. hemionus* (Ice Age donkey). Most important are

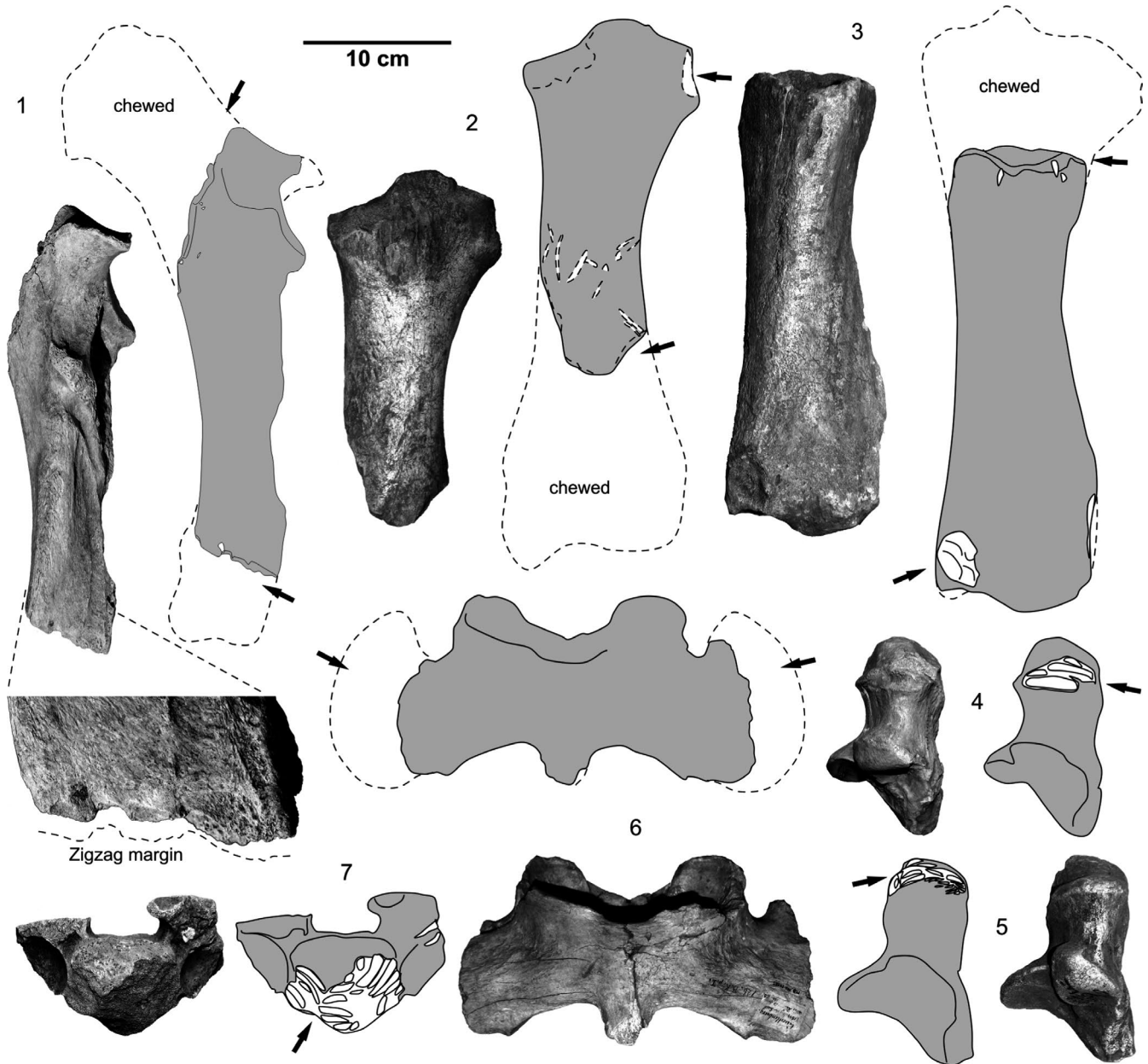


FIGURE 14 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* by hyenas chewed bones. 1. Chewed ulna (MLU.IFG no. 2010. Sew-123), lateral. 2. Cracked and chewed left radius (MB no. Ma.24704), lateral. 3. Chewed left tibia (MB no. Ma.25552), cranial. 4. Chewed left calcaneus (MB no. Ma.25577), cranial. 5. Chewed left calcaneus (Qued-Sew-7), cranial. 6. Chewed atlas (MB no. Ma.24881), ventral. 7. Chewed T1 (MB no. Ma.24924), cranial

the metapodials to distinguish the large and small horse types of the Ice Age (cf. Cramer, 2002; Diedrich, 2012a, 2014c; Forsten, 1987).

There are two complete metacarpi of *E. f. fossilis* (Figure 18.1–18.3) which are 242–245 mm in length and both 57 mm in distal width. Those data refer to a “large horse” sensu (Forsten, 1987).

The smaller horses *E. f. przewalskii* (Figure 17) were newly analysed at the Westeregeln site with “*E. germanicus* Nehring, 1884” to represent nothing else as this small horse (Diedrich, 2012a), are also herein demonstrated to

have smaller metacarpi. The three complete metacarpi from Sewecken-Berge are in lengths of 227–235 mm, with distal widths of 52–55 mm (Table 9). The variability in size, especially in the long bones, seems to be the result of sexual dimorphism (cf. radius Figure 17.5 and Figure 20), with the few larger males and the females (cf. Cramer, 2002; Diedrich, 2012a, 2014c; Forsten, 1987; Spöttel, 1926; Volf, 1996;). The proportions of the Sewecken-Berge small horses fit exactly in the variability of the Westeregeln site *E. f. przewalskii* horses (cf. Diedrich, 2012a) and modern ones (Forsten, 1987). Other comparable “small” horse

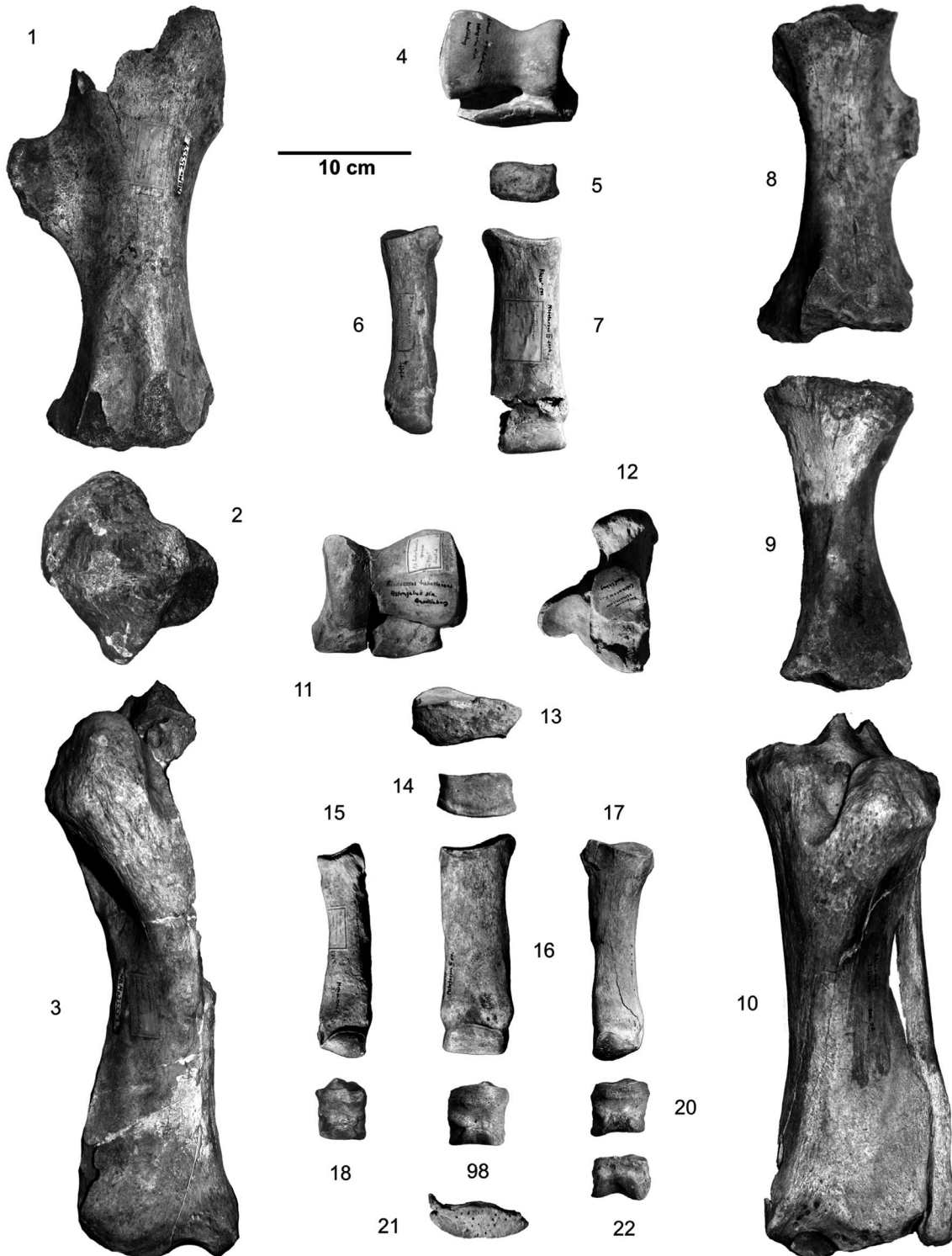


FIGURE 15 Late Pleistocene woolly rhinoceros *Coelodonta antiquitatis* hind limb remains from Quedlinburg, Sewecken-Berge. 1. Right femur shaft of an adolescent animal (MB no. Ma.25551), cranial. 2. Right patella (MB no. Ma.25701), cranial. 3. Right incomplete tibia (MB no. Ma.25553), cranial. 4. Left astragalus (MLU.IFG no. 2010. Sew-83), cranial. 5. Right cuneiform III (MB no. Ma.7330), cranial. 6. Right Mt IV (MB no. Ma.25633), cranial. 7. Right Mt II (MLU.IFG no. 2010. Sew-136), cranial. 8. Right femur shaft of a calf MQ no. Qued-Sew-4), cranial. 9. Right tibia shaft of a calf (MQ no. Qued-Sew-5), cranial. 10. Left tibia/fibula (MLU.IFG no. 2010. Sew-77/85), cranial. 11. Right astragalus (MLU.IFG no. 2010. Sew-126), cranial. 12. Left calcaneus (MLU.IFG no. 2010. Sew-82), dorsal. 13. Left cuboid (MLU.IFG no. 2010. Sew-92), cranial. 14. Left cuneiform III (MLU.IFG no. 2010. Sew-107), cranial. 15. Left Mt II (MLU.IFG no. 2010. Sew-81), cranial. 16. Left Mt III (MLU.IFG no. 2010. Sew-135), cranial. 17. Left Mt IV (MLU.IFG no. 2010. Sew-106), cranial. 18. Phalanx I (MB no. Ma.25676), dorsal. 19. Phalanx II (MLU.IFG no. 2010. Sew-109), dorsal. 20. Phalanx II (MLU.IFG no. 2010. Sew-99), dorsal. 21. Phalanx III (MLU.IFG no. 2010. Sew-93), dorsal. 22. Phalanx II (MLU.IFG no. 2010. Sew-103), cranial



FIGURE 16 Late Pleistocene bovid *Bison priscus* remains from Quedlinburg, Sewecken-Berge. 1. Dm³ of a calf (MLU.IFG no. 2010. Sew-493), labial. 2. P⁴ of a calf (MLU.IFG no. 2010. Sew-488), lingual. 3. P³ of a calf (MLU.IFG no. 2010. Sew-491), lingual. 4. P₁ of a calf (MLU.IFG no. 2010. Sew-499), cranial. 5. Left upper jaw P4-M3 (MLU.IFG no. 2010. Sew-479), (a) lateral, (b) ventral. 6. Right mandible fragment of a grown-up bison (MLU.IFG no. 2010. Sew-454), lateral. 7. Right mandible fragment of a grown-up bison (MB no. Ma.7072), lateral. 8. C (MLU.IFG no. 2010. Sew-477), cranial. 9. C6 of an adolescent animal (MB no. Ma.24094), cranial. 10. T1 (MLU.IFG no. 2010. Sew-347), cranial. 11. T, middle of a young animal (MLU.IFG no. 2010. Sew-348), cranial. 12. T of an adolescent animal (MB no. Ma.24103), cranial. 13. Left radius of an adolescent (MLU.IFG no. 2010. Sew-470), lateral. 14. Right radiale (MLU.IFG no. 2010. Sew-457), cranial. 15. Right intermedium (MLU.IFG no. 2010. Sew-458), cranial. 16. Right ulnare (MLU.IFG no. 2010. Sew-456), cranial. 17. Right carpale 2 + 3 (MLU.IFG no. 2010. Sew-468), cranial. 18. Right carpale 4 (MLU.IFG no. 2010. Sew-469), cranial. 19. Left metacarpus (MLU.IFG no. 2010. Sew-459), cranial. 20. Right femur of a calf (MLU.IFG no. 2010. Sew-426), cranial. 21. Right metatarsus of a calf (MLU.IFG no. 2010. Sew-423), cranial. 22. Phalanx I of a calf (MLU.IFG no. 2010. Sew-428), cranial. 23. Phalanx II of a calf (MLU.IFG no. 2010. Sew-435), cranial. 24. Phalanx II of a calf (MLU.IFG no. 2010. Sew-445), cranial. 25. Right metatarsus (MLU.IFG no. 2010. Sew-424), cranial. 26. Left metatarsus of an adolescent (MB no. Ma.7226), cranial. 27. Right astragalus (MB no. Ma.7274), dorsal. 28. Left calcaneus (MLU.IFG no. 2010. Sew-460), cranial. 29. Left naviculare (MLU.IFG no. 2010. Sew-426), cranial. 30. Left metatarsus (MLU.IFG no. 2010. Sew-), cranial. 31. Sesamoidea (4 x) (MLU.IFG no. 2010. Sew-442–443, 449–450), cranial. 32. Phalanx I (MLU.IFG no. 2010. Sew-424), cranial. 33. Phalanx I (MLU.IFG no. 2010. Sew-427), cranial. 34. Phalanx II (MLU.IFG no. 2010. Sew-436), cranial. 35. Phalanx II (MLU.IFG no. 2010. Sew-438), cranial. 36. Phalanx III (MLU.IFG no. 2010. Sew-447), cranial. 37. Phalanx III (MLU.IFG no. 2010. Sew-440), cranial

materials from other European hyena den sites are described for the German Perick Caves (Diedrich, 2005d) or the Czech Republic Srbsko Chlum-Komín Cave (Diedrich, 2010b), or French Rochelot Cave (Tournepiche & Couture, 1999). The tracks of those small horses have even been mapped (together with other trackways) in middle Late Pleistocene river bank sands along the Emscher River in the "Münsterland Bay" of northern Germany (Diedrich, 2011b), and parallel trackways with foal tracks in the final Late Pleistocene volcano ashes of Merzen, both in north-western Germany. The presence of Przewalski horses in the Late Pleistocene (Weichselian/Wuermian) of Europe and Asia is well known (Forsten, 1987; Cramer, 2002; Koenigswald, 2002), and their remains have been recorded from several hyena prey storage areas at cave and "open-air loess" den sites in central Europe (Diedrich, 2005c, 2010b; Diedrich & Žák, 2006; Tournepiche & Couture, 1999). During the Upper Pleistocene, the small caballoid horse *E. f. przewalskii* was common in central Europe, especially during the glacial periods (Bosinski, 1992; Cramer, 2002; Koenigswald, 2002). Przewalski horse remains have been reported from early Upper Pleistocene (middle Palaeolithic) sites and late Upper Pleistocene to even Holocene (early Mesolithic) sites in northern Germany (Bosinski, 1992; Springhorn, 2003) and are still present with rebreeding populations in Central Asia (Volf, 1996). Many artistic representations of *E. f. przewalskii* from the Late Palaeolithic (especially from the Magdalenian) are known from the cave and mobile art of Europe (e.g. Leroi-Gourhan, 1971).

The metacarpus of the smallest equid of *E. h. hemionus* is 230 mm in length and only 33 mm wide distally. The metatarsi are in the horses incomplete to compare, but in the Ice Age donkey, it has again typical slim width proportions (length = 251 mm, distal width = 37 mm). The discussion about the relationship of European Ice Age donkeys to modern Asian donkeys (cf. Zessin et al., 2009) still lacks in DNA or bone osteometric analyses in a European scale. Possibly, even two different donkey subspecies were present in Europe during the Ice Age, most probably the "Kulan" (cf. Zessin et al., 2009).

3.8 | Hyenas as specialized horse and donkey hunters

Ice Age spotted hyenas imported horse carcasses (Figure 14c) to their cave and open-air dens (commuting and prey storage den types) in order to be able to avoid conflict with lions while feeding, to feed their cubs and to hide food for periods of food shortage. Similar examples of the import and storage of higher horse amount prey remains have also been documented from the SW-France Rochelot Cave hyena den (Tournepiche & Couture, 1999), and the Carmiac Cave hyena

den (Guadelli, 1989), and from the Srbsko Chlum-Komín Cave hyena den in the Czech Republic, which contains the greatest known accumulation of Przewalski horse bones including foetal skeletons (1,500 bones; Diedrich, 2010b). At many other Late Pleistocene hyena den caves in the Czech Republic (Diedrich, 2010b; Diedrich & Žák, 2006) and northern Germany (Diedrich, 2010b, 2011f), the different body parts of these horses can usually be found, but articulated legs are predominant. These were often imported and then left untouched by hyenas, as seen at the Rochelot Cave (Tournepiche & Couture, 1999), the Srbsko Chlum-Komín Cave (Diedrich, 2010b) and in the gypsum karst open-air hyena den site at Westeregeln (Diedrich, 2012a) and now herein at Sewecken-Berge (Figure 17). This explains perfect the taphonomic situation of the "Unicorn holotype skeleton," which must have been one or two horse legs and vertebral column, remains each found in articulation. Modern spotted *C. c. crocuta* engage in a similar type of "horse" hunting (although in Africa the prey are zebras), resulting in a similar overrepresentation of distal leg remains, as well as large quantities of teeth from crushed skulls (Diedrich, 2010b). Also at Sewecken-Berge, the high amount (48% of the horse NISP) is isolated teeth or teeth row parts (Figure 17), which fit into a hyena den taphonomic situation. In the Ngorongoro Crater, for example, zebras can form up to 70% of hyena prey (Kruuk, 1972). In certain areas or at certain times hyenas may switch to hunting more juvenile zebras (Cooper, 2008). Hyenas can dismember in five minutes of zebra carcasses escaping quickly with the skull, legs and vertebral column, as has been documented photographically (cf. Diedrich, 2010b). The "Unicorn holotype skeleton" must have resulted from the accumulated body pieces the same way by hyenas, which were hiding legs further untouched in the gypsum karst dolines.

A predominance of leg bones at hyena bone accumulation sites such as demonstrated also for Sewecken-Berge is well known from both Late Pleistocene hyena den sites (e.g. Arribas & Palmqvist, 1998; Tournepiche & Couture, 1999) and modern African hyena dens (Arribas and Palmqvist, 1998; Avery et al., 1984; Hill, 1980, 1989; Hofer, 1998; Lansing et al., 2007; Pickering, 2002; Pokines & Peterhans, 2007; Scott & Klein, 1981;). Hyenas remove the legs from megafauna carcasses (cf. for zebras/horses: Diedrich, 2010d; Pokines & Peterhans, 2007), which explains the predominance of fore and hind leg bones. Other bones being more scavenged and damaged by modern hyenas are from the thorax and include the vertebral column, ribs and even pelvic remains (Avery et al., 1984; Behrensmeier & Boaz, 1980; Di Silvestre et al., 2000). The thorax remains (vertebral column, ribs) were left more often at the killing site on, when feeding the intestines/inner organs.

The population statistics of the Sewecken-Berge *E. c. przewalski* horses fit perfectly into a hyena den bone assemblage. Only 7% of the bones are from foals to adolescents, and most (85%) are from grown-up to late adults. This does

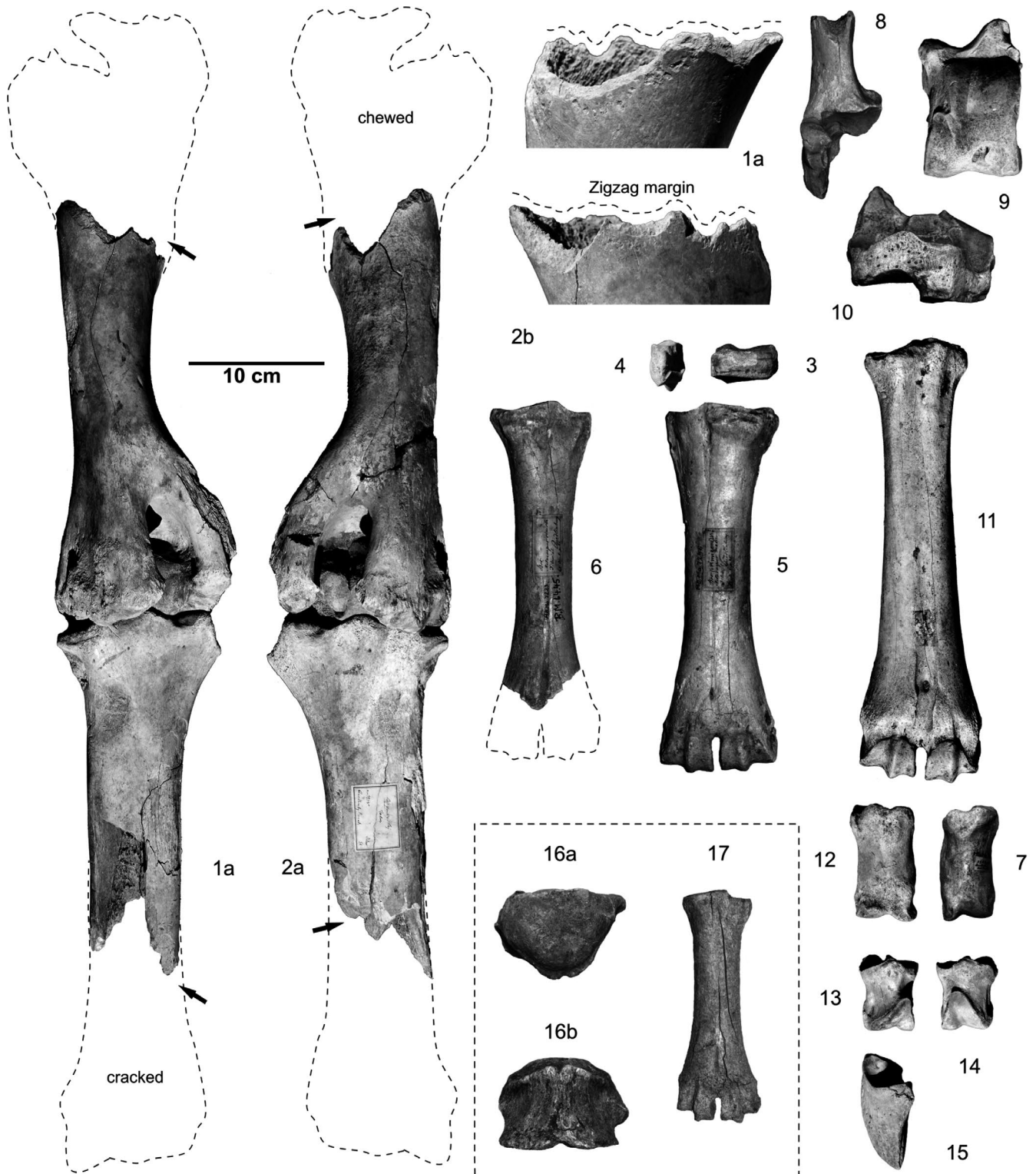


FIGURE 17 Late Pleistocene bovid 1–15. *Bos primigenius* and 16–17. *Ovibos moschatus* remains from Quedlinburg, Sewecken-Berge. 1. Left humerus and radius (MLU.IFG no. 2010. Sew-418–419), caudal. 2. Right humerus and radius (MLU.IFG no. 2010. Sew-417/420), caudal. 3. Left carpale 3 + 4 (MLU.IFG no. 2010. Sew-476), cranial. 4. Left maleolare (MLU.IFG no. 2010. Sew-471), cranial. 5. Right metacarpus (MBno. Ma.7246), cranial. 6. Left metacarpus (MBno. Ma.7223), cranial. 7. Phalanx I (MBno. Ma.7351), dorsal. 8. Right calcaneus (MBno. Ma.7322), cranial. 9. Right astragalus (MLU.IFG no. 2010. Sew-451), ventral. 10. Left naviculare (MLU.IFG no. 2010. Sew-448), cranial. 11. Left metatarsus (MLU.IFG no. 2010. Sew-415), cranial. 12. Phalanx I (MLU.IFG no. 2010. Sew-416), dorsal. 13. Phalanx II (MLU.IFG no. 2010. Sew-473), dorsal. 14. Phalanx II (MLU.IFG no. 2010. Sew-474), dorsal. 15. Phalanx III (MLU.IFG no. 2010. Sew-472), dorsal. 16. Cervical vertebra centrum (MB no. Ma.24926), (a) cranial, (b) ventral. 17. Left metacarpus (MQ no. Quedl-Sew-11), cranial

not reflect normal horse mortality at all and supports its origin of large predator accumulation origin. Very similar high amounts of adult- late adult horses have been found at some other well studied and horse-bone-rich hyena den sites. The hyena dens of the Srbsko Chlum-Komín (Diedrich, 2010b) and Koneprusy Cave (Czech Republic) have the highest proportions of horse remains (about 50%) in hyena bone assemblages, whereas most other hyena den sites in Europe have 25%–40% horse remains (e.g. Sauerland Karst, northern Germany: Diedrich, 2005a,2005b,2005c; Diedrich, 2010b, Czech Republic: Diedrich 2011h; Diedrich & Žák, 2006). At Westeregeln, the large quantities of horse remains (25%) indicate a hyena bone assemblage, but these quantities may also have been influenced by significant human Neanderthal activities (Diedrich, 2012a, 2013b).

The large quantities of unchewed horse prey remains, especially distal leg remains, both here and at the Rochelot Cave and Srbsko Chlum-Komín Cave hyena dens (Diedrich, 2010b; Tournepiche & Couture, 1999), are astonishing and can be only explained by good hunting seasons and large horse populations. Also, bones are more untouched at commuting and prey storage sites, whereas the bone damage degree is much higher at birth dens and their surrounding. This is also demonstrated at the Perick Caves, where the horse remains are much more damaged, and where bones are cracked and nibbled mainly by cubs (Diedrich, 2005c).

3.9 | Hyenas as seasonal steppe bison hunters

The material from Sewecken-Berge was compared directly to one complete male and female skeleton of *B. primigenius*

from the Neumark-Nord Lake 1 sites (cf. Döhle, 1990, 2010). Recently published hyena den cave sites with abundant bovid remains such as southern French Rochelot Cave (Tournepiche & Couture, 1999) and Camiac Cave (Guadelli, 1989) have similar abundant distal leg remains such as found at Sewecken-Berge. At other cave sites, their bones are more destroyed (Diedrich, 2005b), whereas best examples for cracking metapodials and long bone shafts at the den site after the leg import is best demonstrated at the Czech Republic Srbsko Chlum-Komin Cave (Diedrich, 2012d).

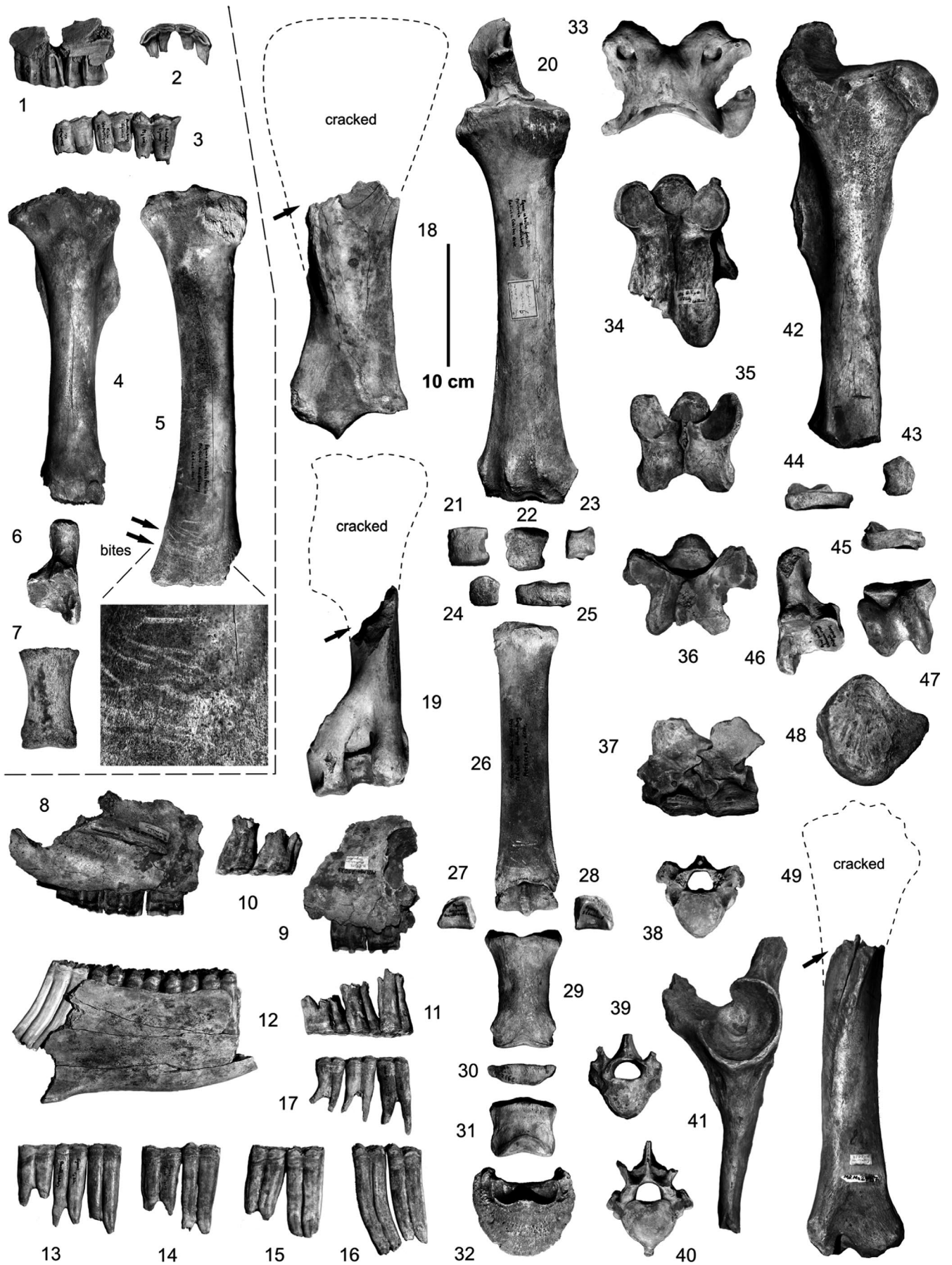
3.10 | Hyenas and lions in antagonism

Even lion remains seem to have been imported into the Sewecken-Berge site, as indicated by a cracked humerus of a lion cub (Figure 6.4). Such scavenging and importation of *P. l. spelaea* carcasses by hyenas have also been recognized in the Perick Caves (Diedrich, 2009; Diedrich, 2014c), the Zoolithen Cave (Diedrich, 2011b) and at various open-air sites in Germany (Diedrich, 2012a, 2014a). Possibly, lions were also killed occasionally at the commuting site Sewecken-Berge, during battles over the prey hyenas, or for protection of their cubs, whereas best Pleistocene examples are published for a killed lioness at the hyena den Srbsko Chlum-Komín Cave.

3.11 | Wolf cub rising den or hyena kills?

The wolves from Sewecken-Berge are indeed unclear in their subspecies, whereas a full revision by DNA and

FIGURE 18 Late Pleistocene equid *Equus ferus przewalskii* 1–7. foal and 8–49. adult animal remains from Quedlinburg-Sewecken-Berge. 1. Left maxillary with dm^{1-2} of a 2 weeks old foal (MLU.IFG no. 2010. Sew-308), lateral. 2. Four milk teeth (di) of a 2 weeks young foal (MLU.IFG no. 2010. Sew-248), dorsal. 3. Left $dm_{1,3}$ of a 2 weeks old foal (MLU.IFG no. 2010. Sew-376), lateral. 4. Left femur of a very young foal (MB no. Ma.23943), cranial. 5. Right radius of a foal (MLU.IFG no. 2010. Sew-341), cranial. 6. Left calcaneus of a foal (MLU.IFG no. 2010. Sew-328), cranial. 7. Phalanx I of a foal (MLU.IFG no. 2010. Sew-313), dorsal. 8–9. Right and left maxillary of a late adult animal (MB no. Ma.25032, Ma.25033), lateral. 10–11. Skull dentition M^{1-2} and M^{1-3} of a late adult animal (MLU.IFG no. 2010. Sew-275), lateral. 12. Right mandible fragment (MLU.IFG no. 2010. Sew-351), lateral. 13. Left P_{2-4} (MLU.IFG no. 2010. Sew-361), lateral. 14. Left P_{3-4} (MLU.IFG no. 2010. Sew-362), lateral. 15–16, 17. Left dentition P_4 - M_2 of a late adult animal (MLU.IFG no. 2010. Sew-367), lateral. 18. Left scapula (MLU.IFG no. 2010. Sew-338), lateral. 19. Left humerus (MLU.IFG no. 2010. Sew-343), caudal. 20. Right ulna/radius (MLU.IFG no. 2010. Sew-340), cranial. 21. Right radiale (MLU.IFG no. 2010. Sew-397), cranial. 22. Right intermedium (MLU.IFG no. 2010. Sew-395), cranial. 23. Right carpale IV (MLU.IFG no. 2010. Sew-400), cranial. 24. Left carpale II (MLU.IFG no. 2010. Sew-391), cranial. 25. Left carpale III (MLU.IFG no. 2010. Sew-392), cranial. 26. Right metacarpus (MLU.IFG no. 2010. Sew-329), cranial. 27. Sesamoid (MLU.IFG no. 2010. Sew-383), cranial. 28. Sesamoid (MLU.IFG no. 2010. Sew-381), cranial. 29. Phalanx I (MLU.IFG no. 2010. Sew-318), dorsal. 30. “Strahlbein” (MLU.IFG no. 2010. Sew-411), dorsal. 31. Phalanx II (MLU.IFG no. 2010. Sew-325), dorsal. 32. Phalanx III (MLU.IFG no. 2010. Sew-319), dorsal. 33. Atlas (MLU.IFG no. 2010. Sew-346), cranial. 34. C3 or 4 (MB no. Ma.24091), dorsal. 35. C6 (MB no. Ma.24092), dorsal. 36. C7 (MB no. Ma.24095), dorsal. 37. Two middle T (MB no. Ma. 24098/24099), lateral. 38. Middle T (MLU.IFG no. 2010. Sew-350), dorsal. 39. First of the two articulated middle T (MB no. Ma. 24,098), lateral. 40. Middle T (MLU.IFG no. 2010. Sew-349), dorsal. 41. Left coxa (MB no. Ma.23939), lateral. 42. Right incomplete femur (MB no. Ma.23945), cranial. 43. Right tarsale IV (MLU.IFG no. 2010. Sew-404), cranial. 44. Right tarsale III (MLU.IFG no. 2010. Sew-401), cranial. 45. Left centrale (MLU.IFG no. 2010. Sew-410), cranial. 46. Right calcaneus (MLU.IFG no. 2010. Sew-324), cranial. 47. Left astragalus (MLU.IFG no. 2010. Sew-330), dorsal. 48. Left patella (MLU.IFG no. 2010. Sew-344), cranial. 49. Left cracked tibia (MB no. Ma.24157), cranial



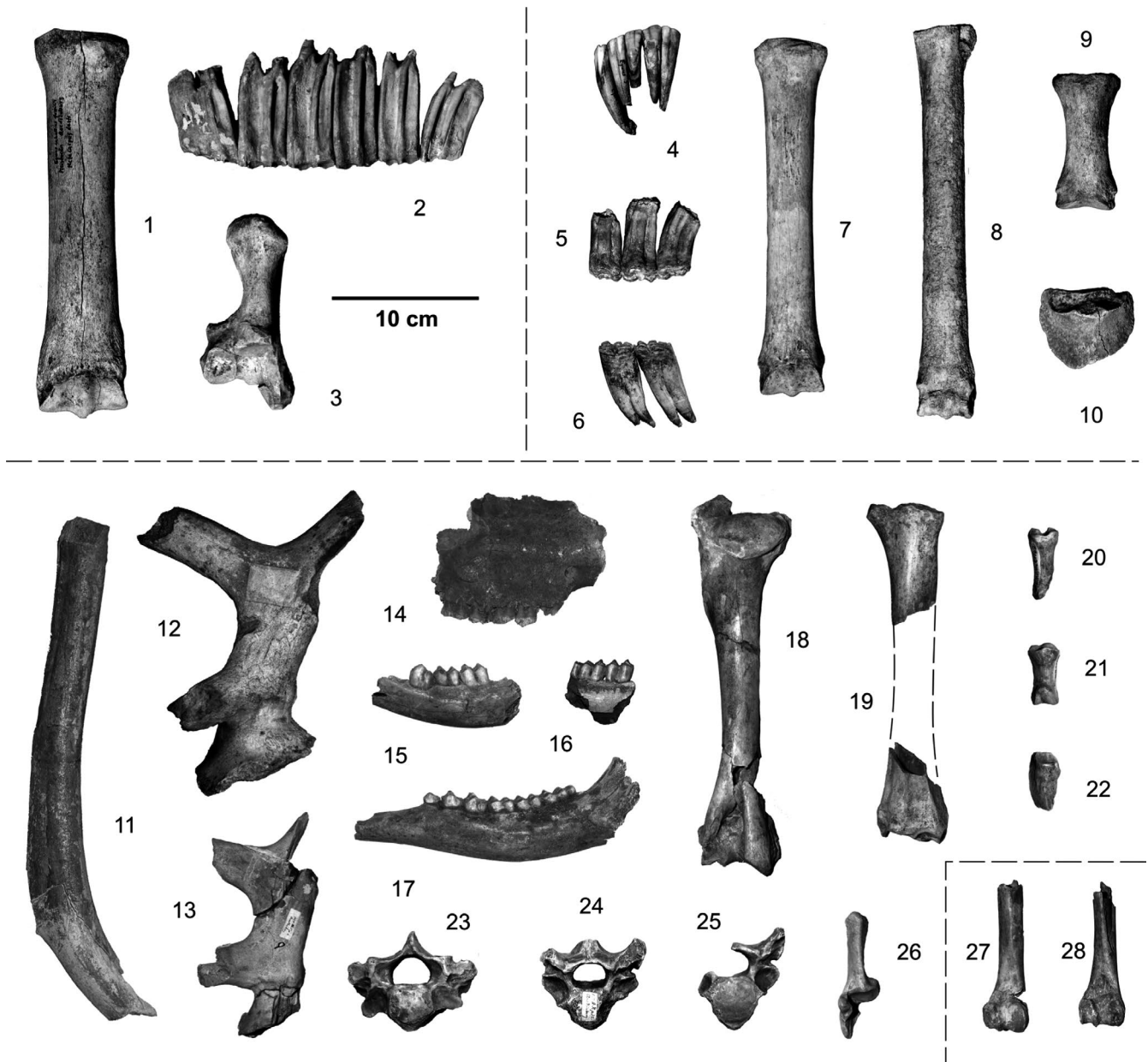


FIGURE 19 Late Pleistocene equid and cervid remains from Quedlinburg-Sewecken-Berge. 1–3. *Equus ferus fossilis*: 1. Right metacarpus (MLU.IFG no. 2010. Sew-322), cranial. 2. Upper jaw dentition (MLU.IFG no. 2010. Sew-300), cranial. 3. Left calcaneus Right metacarpus (MLU.IFG no. 2010. Sew-320), cranial. 4–10. *Equus hemionus hemionus*: 4. Incisive dentition (MLU.IFG no. 2010. Sew-247), cranial. 5. Right M¹⁻³ dentition (MLU.IFG no. 2010. Sew-242), cranial. 6. Left M₁₋₂ (MLU.IFG no. 2010. Sew-245), cranial. 7. Right metacarpus (MLU.IFG no. 2010. Sew-241), cranial. 8. Right metatarsus (MLU.IFG no. 2010. Sew-240), cranial. 9. Phalanx I (MLU.IFG no. 2010. Sew-239), dorsal. 10. Phalanx III (MLU.IFG no. 2010. Sew-238), dorsal. 11–26. *Rangifer tarandus*: 11. Antler fragment (MLU.IFG no. 2010. Sew-505), lateral. 12. Cranial connected antler (MLU.IFG no. 2010. Sew-506), lateral. 13. Cranial connected antler (MB no. Ma.21158), lateral. 14. Right maxillary fragment (MQ no. Quedl-Sew-8), lateral. 15. Left mandible (MQ no. Quedl-Sew-9), lateral. 16. Right mandible fragment (MLU.IFG no. 2010. Sew-512), lateral. 17. Left mandible (MQ no. Quedl-Sew-10), lateral. 18. Left humerus (MLU.IFG no. 2010. Sew-507), caudal. 19. Left radius (MLU.IFG no. 2010. Sew-509/510), lateral. 20. Phalanx I (MB no. Ma.21162), dorsal. 21. Phalanx II (MB no. Ma.21159), dorsal. 22. Phalanx III (MB no. Ma.21163), dorsal. 23. T1 (MB no. Ma.24097), cranial. 24. T2 (MB no. Ma.24100), cranial. 25. T3 (MB no. Ma.24107), cranial. 26. Right calcaneus (MB no. Ma.21182), cranial. 27–28. *Capreolus capreolus*: 27. Left humerus (MLU.IFG no. 2010. Sew-519), cranial. 28. Left humerus (MLU.IFG no. 2010. Sew-520), cranial

osteometry lack for the Late Pleistocene wolves, whereas at least a medium-sized “ecomorph type” which correlate with *Canis lupus spelaeus* (Goldfuss, 1823), was already

established by DNA in the Late Pleistocene (Leonard et al., 2007). The proportions of the complete femur (Figure 6.43) would indicate more a “warm period” and smaller sized

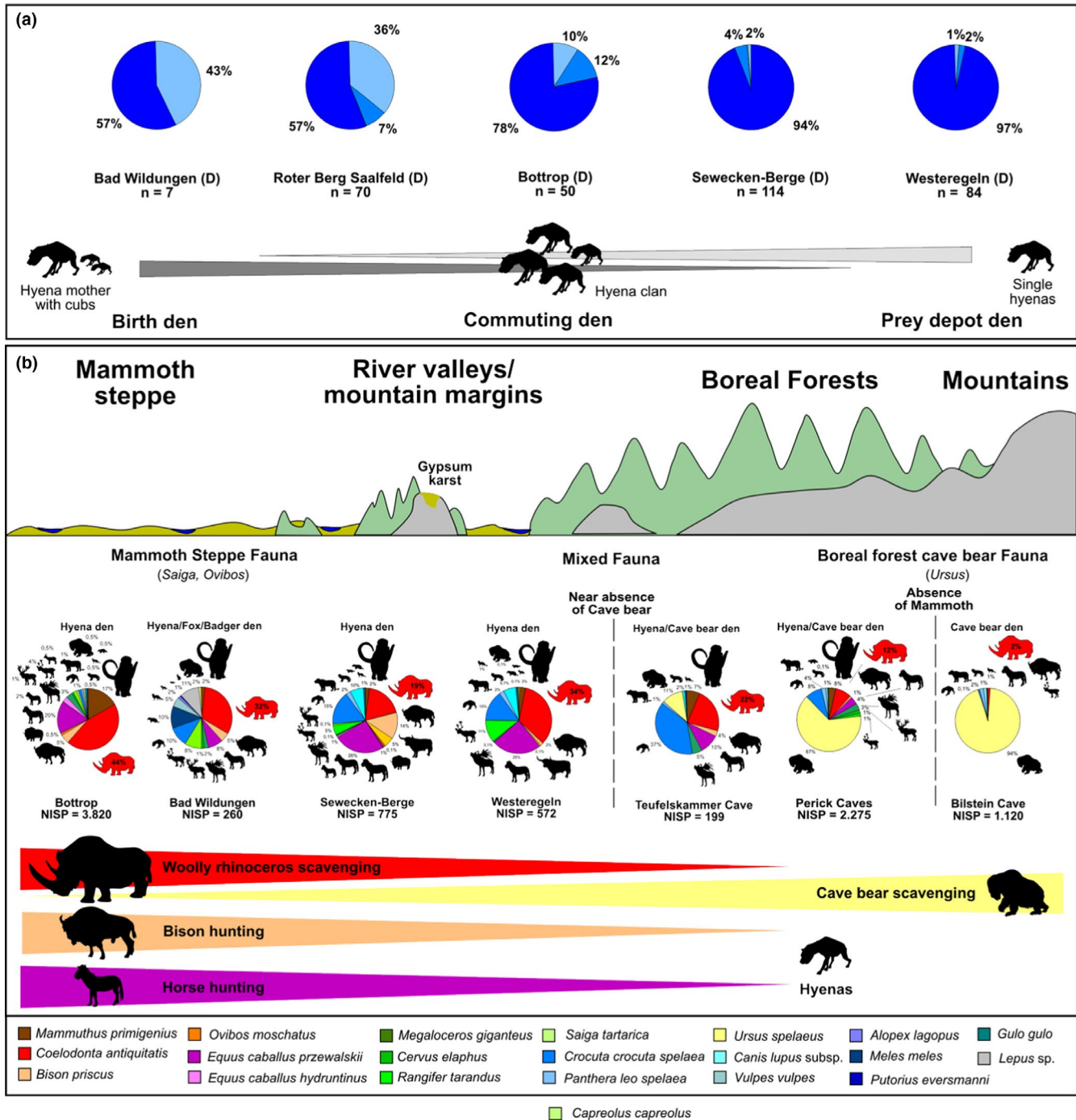


FIGURE 20 (a) Hyena population at open-air sites of northern Germany, and (b) Prey fauna and bone accumulation compositions of hyena dens in northern Germany (Quedlinburg and Saalfeld new, other data from Diedrich, 2011b, 2012a)

(similar as modern European wolf) form, which was also reported from the Eemian interglacial lake deposits Neumark-Nord (Ambros, 2010) or Sophie's Cave (Diedrich, 2013a).

At Sewecken-Berge, a quite high amount of wolf remains is present (10% of NISP). There are also other German cave sites, where higher amounts of wolf remains were found (Martins Cave, Sauerland Karst, unpublished data and Sophie's Cave, Franconian Karst: Diedrich, 2012e). The

material of Sewecken-Berge is quite selective with dominance of cranial and mainly distal leg remains with the thorax and forelimb remains nearly being absent (Figure 6.16–6.63). This taphonomic situation would indicate a scavenging by large carnivores. At several sites, similar as in Italian hyena cave den sites (Stiner, 2004), it is unsolved if wolf remains were the result of hyena clan versus wolf pack antagonism. In such cases, hyenas would have imported killed

wolves to their den, or even killed them during battles at the commuting den about stored prey. Another possibility is the presence of periodical wolf den overlapping with hyena dens (smaller caves), but those only used smaller cavities for cub rising if compared to modern wolves (e.g. Mech, 1988; Mech & Packard, 1990; Bibikow, 2003). The bone material from *C. lupus* cf. *spelaeus* of Sewecken-Berge does not support such cub den site presence, because all materials are only from adult to late adult individuals. Some of the lower jaws seem to have been cracked by a carnivore, such as the skulls.

4 | CONCLUSIONS

The original “Quedlinburger Unicorn holotype skeleton” called *Unicornu fossile* Valentini, 1714 found in 1663 is sadly lost (possibly some bones survived) and was a composite of a fossil Late Pleistocene elephant (*Palaeoloxodon/Mammuthus*) tusk (=horn) and horse skeleton body part remains, a skull, two front legs and vertebral column ranging from the cervical to thoracic vertebrae. The compiling of different historically collected bones from the Muschelkalk gypsum karst dolines and new field research at the open accessible gypsum karst quarries on the Sewecken-Berge near Quedlinburg (Saxony-Anhalt, Germany) are important for the reconstruction of the Middle Palaeolithic Neanderthal times megafauna and possible prey situation or competition with top predators, from which several Middle Palaeolithic (Eemian-Weichselian) camp sites are known from the lowlands surrounding landscapes east of the Harz Mountains of Central Germany (Saxony-Anhalt), such as the most famous Westeregeln, Koenigsau or Neumark-Nord, where stone tools and megafauna remains have been excavated. In contrast to the other bone-rich sites, at Quedlinburg a “non-human-influenced bone accumulation” is present, which is underlined by high percentages of carnivore remains. The gypsum karst hill of the Sewecken-Berge must have been used starting in the Eemian warm period and mainly during the early–middle Late Pleistocene by hyena clans over generations. The high percentage (15%) of hyena remains is key for the identifying the megafauna bone accumulation, where no human artefacts nor cut marks on bones were observed, to be only or mainly of hyena origin. The few percentage of hyena cub remains indicate a non-cub raising or birth den area, instead a commuting and prey storage site. About 15% of the bones are warm period faunal remains. Remains of the large horse *Equus ferus fossilis*, the bovid *Bos primigenius* and the roe deer *Capreolus capreolus* are further indicators, but similar as in the Eemian fauna of Neumark-Nord Lake 1, suids are missing indicating a savannah-like surrounding vegetation palaeoenvironment. Compared to the fewer north situated Westeregeln hyena commuting and prey storage den, at

Quedlinburg, there are in percentages less hyena remains but a larger amount of wolf remains. Possibly cave cavities were not used by wolves, for cub rising, because the population is clearly dominated by grown-up wolves, which have bite damages on the cranial material, and are represented mainly without thoracic and forelimb remains. This would indicate more a scavenging situation by hyenas. Similar as at many hyena den sites, also at Quedlinburg again rhinocerotid (19%) and equid bones (28%; mainly leg and cranial remains) dominate the prey bone assemblage, but in Quedlinburg a larger percentage of bovids (18%), mainly bisons, differs. At Sewecken-Berge, a seasonal specialization during a warm period on *B. primigenius* and the cold period on *B. priscus* can be observed, which is similar to few other hyena dens such as German Salfeld-Roter Berg open-air, or French Carmiac Cave and Rochelot Cave hyena dens of Europe. The woolly mammoth, woolly rhinoceros, Przewalski horse and steppe bison abundance at Sewecken-Berge reflect a mammoth grass steppe vegetation palaeoenvironment during the Weichselian cold period of the early to middle Late Pleistocene, which correlate with the results of similar aged Westeregeln hyena den site. Rare remains of *Ovibos moschatus* and *Equus hemionus hemionus* at Quedlinburg indicate at least periodically very cold climates and open grass- or taiga-like landscapes, too.

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