

# CAVE BEAR, CAVE LION AND CAVE HYENA SKULLS FROM THE PUBLIC COLLECTION AT THE HUMBOLDT MUSEUM IN BERLIN

## LOBANJE JAMSKEGA MEDVEDA, JAMSKEGA LEVA IN JAMSKE HIJENE IZ ZBIRKE HUMBOLDTOVEGA MUZEJA V BERLINU

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### Abstract

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*Stephan Kempe and Doris Döppes: Cave bear, cave lion and cave hyena skulls from the public collection at the Humboldt Museum in Berlin*

The Linnean binomial system rests on the description of a holotype. The first fossil vertebrate species named accordingly was *Ursus spelaeus*, the cave bear. It was described by Rosenmüller in 1794 in his dissertation using a skull from the Zoolithen Cave (Gailenreuth Cave) in Frankonia, Germany. The whereabouts of this skull is unknown. In the Humboldt Museum, Berlin, historic skulls of the three "*spelaeus* species" (cave bear, cave lion, cave hyena) are displayed. We were allowed to investigate them and further material in the Museum's archive in an attempt to locate the holotype skull. Here we report about our findings giving pertinent measurements of this historic material and depicting it for the first time. Studying the old labels we were able to establish the provenience of much of the material that includes in fact specimens from the original Rosenmüller collection. One of the cave lion skulls may actually be the one used in establishing the cave lion by Goldfuß (Diedrich 2008) while another may be the original that was used to define a "cave wolf".

**Keywords:** holotypes, cave bear, cave lion, cave hyena, Zoolithen Cave, Rösenbeck Cave, Humboldt Museum, Berlin.

### Izvleček

UDK 569(069.5)(430 Berlin)  
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*Stephan Kempe and Doris Döppes: Lobanje jamskega medveda, jamskega leva in jamske hijene iz zbirke Humboldtovega muzeja v Berlinu*

Linnejev binomski sistem poimenovanja temelji na opisu holotipa. Jamski medved je bil prva vrsta fosilnih vretenčarjev zapisana v tem sistemu. V svoji disertaciji ga je opisal Rosenmüller leta 1794, pri čemer je uporabil okostje iz jame Zoolithen (Gailenreuthska jama) v Frankoniji. Okoliščine oziroma usoda tega skeleta je neznana. Humboldtov muzej v Berlinu hrani tri fosilne vrste jamskih vretenčarjev: jamskega medveda, hijeno in jamskega leva. Omogočeno nam je bilo raziskovanje teh okostij in ostalega arhivskega gradiva, pri čemer je bil naš namen odkriti lobanjo holotipa. V članku poročamo o naših izsledkih in prvi predstavimo ustrezne meritve tega zgodovinskega gradiva. Študija oznak gradiva, med katerimi so tudi primerki Rosenmüllerjeve zbirke, nam je omogočila določitev njegovega izvora. Enega od jamskih levov je pri vpeljavi verjetno uporabil Goldfuß (Diedrich 2008), medtem ko je bil nek drug primerek verjetno vzorčni primer pri definiciji »jamskega volka«.

**Ključne besede:** holotipi, jamski medved, jamski lev, jamska hijena, Humboldtov muzej, Berlin.

## INTRODUCTION

Karst depressions and caves were the sources for most of the important early discoveries of extinct Pleistocene animals. At first mined for medical purposes as *unicornu fossile* and attributed to either the unicorn or to dragons

(e.g., Nielbock 2004; Paterson Hain 1673a, b; Vollgnad 1676), the bones started to attract paleontological interest only in the second half of the 18<sup>th</sup> century. Productive caves were the Baumann's and the Unicorn Caves in the

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Harz, several caves in the northern Rhenish Massive, in Franconia the Zoolithen Cave and the caves in the Carpathian Mountains. Horst (1656), in a single sentence, was the first to acknowledge the possible sources of the cave bones from the Unicorn Cave when he wrote: *Juxta sylvam Semanam at radicem Arcis Brunsvicensis Scharzfeld vidi erui ossa, dentis, mandibulas varias, ursarum, leonum, hominum & aliorum animatum emulas*<sup>3</sup>. Paterson Hain, even though a medical doctor, did not follow this insight and classified his cave bear material as “Draco”. At least he was the first to publish exact figures of the enigmatic fossils. Almost 100 years later, still another physician, Johann Friedrich Zückert, visiting the Baumann’s Cave (Zückert 1763; Kempe *et al.* 1999) failed to identify the cave bones correctly. Johann Friedrich Esper’s seminal folio about the bones from the Zoolithen Cave near Gailenreuth (Esper 1774) was a breakthrough in as much as he removed any doubt that the bones belonged to animals like bears. Lacking comparative material he

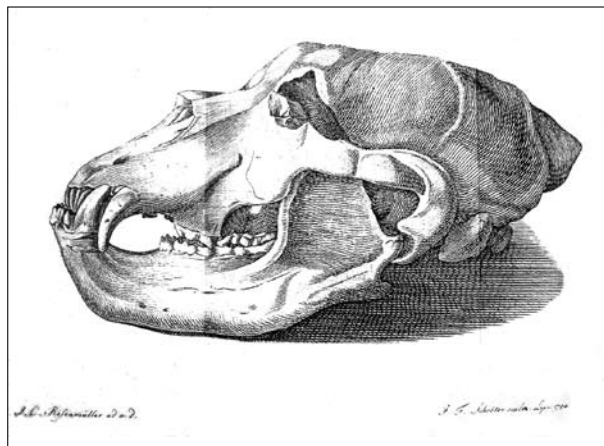


Fig. 1: Complete skull of *Ursus spelaeus* (holotype), copperplate of Rosenmüller, 1794 (Photo: S. Kempe).

assumed the bones to derive from polar bears, washed into Franconian caves by the Deluge. In parallel, Carl von Linné (1707-1778) introduced the concept of the species and established the binominal nomenclature for animals, plants and even rocks (Linné 1758). The concept was eagerly taken up by natural scientists in Scandinavia and Central Europe, but not so quickly by French and British researchers. This is probably the reason why most of the large extinct Pleistocene animals were named

<sup>3</sup> Translation by S. Kempe, Darmstadt, and F. Reinboth, Braunschweig: *Near the Semanish Forest* (i.e. the Harz Mountains), *at the foot of the Brunswick Castle Scharzfeld I saw how bones, teeth, various mandibles, that emulated those of bears, lions, humans and other living beings, were excavated* (Kempe *et al.* 2005).

by Central European scientists. The first was the physician Johann Christian Rosenmüller (1771-1820), who, in his doctoral thesis, presented a complete bear skull of the Zoolithen Cave (Fig. 1) and named it *Ursus spelaeus* in 1794 (Rosenmüller 1794, 1795; Rosendahl & Kempe 2004). Later he also published the post-cranial bones of the cave bear (Rosenmüller 1804). Erdbrink (1953) and Kempe *et al.* (2005) reviewed the literature leading towards this scientific breakthrough that accepted fossil species into the scientific nomenclature. Soon after, the mammoth (*Mammuthus primigenius*, BLUMENBACH, 1799) and the woolly rhinoceros (*Coelodonta antiquitatis*, BLUMENBACH, 1799) were named by Johann Friedrich Blumenbach (1752-1840) (Blumenbach 1799) using material from gypsum karst “Schlotten” among others from the Hainholz near Osterode/South Harz (Vladi 1979). Finally Georg August Goldfuß, again using material from the Zoolithen Cave named the cave lion (*Panthera leo spelaea*, GOLDFUSS, 1810) (*Felis spelaea*



Fig. 2: Mounted cave bear skull with the label showing its provenience from L’Herm (Ariège, France), Collection Marty (public collection at the Humboldt Museum). It is normally displayed from the right side (Photo: S. Kempe).

by Goldfuß 1810) and the cave hyena (*Crocota crocuta spelaea*, GOLDFUSS, 1823) (*Hyaena spelaea* by Goldfuß 1823). He even tried to establish *Canis spelaeus* (Goldfuß 1823) and *Gulo spelaeus* (Goldfuß 1818). Both species were, however, not accepted as separate species as more comparative material became available.

Today, phylogeny is resting on mtDNA sequencing and it would therefore be very important to analyze the holotypes of these species, if they were available. *Ursus spelaeus* (e.g., Hofreiter *et al.* 2004), *Panthera leo spelaea* (Burger *et al.* 2004) and *Crocota crocuta spelaea* (Rohland *et al.* 2005) are being investigated already. Recently three of the holotype fossils were relocated: the tooth that

was used by Blumenbach to establish *Mammuthus primigenius* at the University of Göttingen (Pressemitteilung 23.11.2005), the holotype cave lion skull at the Humboldt Museum and that of the cave hyena at the Goldfuß Museum, Bonn (Diedrich 2008). The Rosenmüller cave bear skull is, however, still missing or may have been lost during the World War II.

Old collections, like the one of the Natural History Museum, Berlin, i.e. the Museum of the Humboldt University (shortly termed Humboldt Museum hereafter), hold historic important specimens that may help in finding the missing specimen. In the public show room of

the Museum the three valid “*spelaeus*-species” are shown side by side. The specimens are apparently from old collections. The Museum was therefore asked permission to look at these more closely and to take pictures. In addition, the authors were allowed to search the archive where much more material is stored. All specimens are noted with their modern archive numbers in a modern specimen book. Older documents seem to be missing. Thus only the specimens themselves and their original stickers may give answers as to their origin and provenience. Skulls and mandibles are measured after Tsoukala and Grandal d’Anglade (2002).

### THE CAVE BEAR SKULL ON DISPLAY

The cave bear skull on display at the Humboldt Museum is a well preserved skull of a large, old individual (reg. No MB 48099, cranium 1, mandible 2; Fig. 2). Both mandibles displayed with it, are apparently not from the same animal since their molars form an angle when the lower jaw is fitted to the skull, thus the animal could not have chewed. Also there is about a 1 cm sideward gap between the molars of the lower jaw and those of the upper jaw.

The skull has a total length of 48 cm and a breadth at the zygomatic arches of 30 cm. The breadth of the maxilla at the canines and between the M2 are 11.96 cm and 12.18 cm, respectively, and the breadth minimum of the maxilla is 5.18 cm. The teeth are well abraded and even the canines are mere stumps not allowing meaningful measurements. The following are still in situ: right: I3, C, P4, M1, M2 and left C, P4, M1, M2 (Fig. 3). The alveoli of the incisors are mostly closed; the animal lost these teeth during life.

The mandibles are 34 (right) and 35 (left) cm long. The maximum height is 21.5 cm (right) while the left processus coronoideus is damaged (19 cm high only). The breadth of the right processus condylaris is 7.64 cm, the left processus is damaged. The mandibles are glued together at their symphysis. The following teeth are present: right C, m1, m2, m3 and left C, m2, m3. The alveoli of both p4 are present. Table 1 gives some measurements of the lower teeth.

The skull is covered with a thin, black but rough flowstone veneer on top. The lower part is more brownish in color, illustrating that the skull was deposited in an upright position with the skull case rising above the sediment.

On the buccal side of the left mandible there is an old printed label saying “L’Herm (Ariège), Collection

Marty”. Apparently both cranium and mandibles have been obtained from that collection together. The mammalian fauna of the cave of L’Herm in southern France was summarized in Clot and Duranthon (1990). No ref-



Fig. 3: Ventral view of the cave bear cranium from L’Herm (Ariège, France) (Photo: S. Kempe).

Tab. 1: *Ursus spelaeus*; teeth measurements (in cm) from L'Herm (Humboldt Museum): Abbreviations: C – canine, P – premolar, M/m – molar, L – length, B – breadth.

maxilla									P4-M2	C-M2
dex									10.00	18.86
sin									9.90	18.76
mandible	C-L	C-B	m1-L	m1-B	m2-L	m2-B	m3-L	m3-B	m1-m3	C-m3
dex	3.53	2.56	3.24	1.68	3.37	2.13	2.96	2.05	9.4	21.75
sin	3.35	2.05*			3.27	1.97	2.97	1.87	9.4*	21.40

\*damaged

reference to the collection Marty was found up to now. The sticker and the overall state of the skull suggest that the

specimen has been a long time in the possession of the Humboldt Museum.

## THE CAVE LION SKULL ON DISPLAY

The Humboldt Museum cave lion skull (MB 48115, cranium 1, mandible 2) in the public collection has been profusely treated with shellac (Fig. 4). The mandible displayed with it does not belong to the same individual. When fitting cranium and mandible together, there is a gap between both last molars of the upper and lower jaws of 1.6 cm (right) and 1.05 cm (left).



Fig. 4: Mounted cave lion skull from the Zoolithen Cave (Germany) of the original Rosenmüller collection (public collection at the Humboldt Museum) (Photo: S. Kempe).

Total length of the skull is 41.7 cm. The breadth at the zygomatic arches can only be estimated because the left side is badly damaged. Measuring from the right zygomatic arch to the sagittal crest of the skull (13.2 cm) a breadth of 26.4 cm can be calculated. In the upper jaw only C and P4 are present. The P4s are heavily abraded lingually. The breadth of the maxilla at

the canines is 11.6 cm and 14.75 cm for the breadth of the maxilla between the P4 (measurements of teeth see Tab. 2; Fig. 5).

Both mandibles are not very well preserved, the sections after the last molars are missing. Therefore no total length or maximum height can be given. The teeth (see Tab. 2 for measurements) are, however, well preserved:

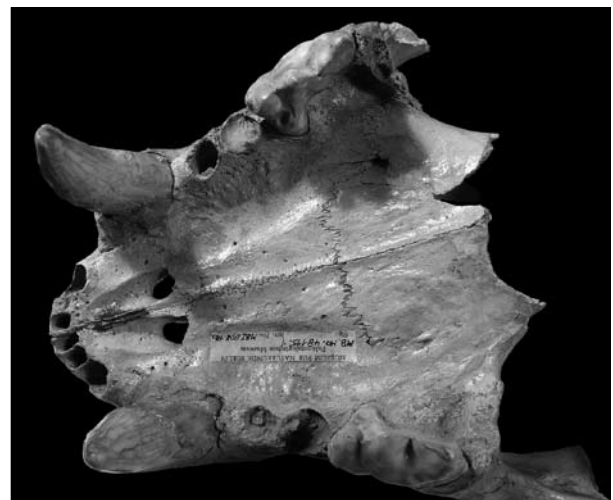


Fig. 5: Ventral view of the cave lion cranium from the Zoolithen Cave (Germany) (Photo: S. Kempe).

all are present apart from right I3. The canines are quite abraded.

Both the cranium and the mandibles carry printed stickers of the Humboldt Museum with handwritten archive numbers. In the current archive book they are

Tab. 2: *Panthera leo spelaea*; teeth measurements (in cm) from Zoolithen Cave (Humboldt Museum): Abbreviations: C – canine, P/p – premolar, M/m – molar, L – length, B – breadth.

maxilla	C-L	C-B					P4-L	P4-B (min)	C-M1	
dex	3.40	2.40					4.17	2.14 (1.63)	12.10	
sin	3.50	2.35					4.20	2.27 (1.63)	11.61	
mandible			p3-L	P3-B	p4-L	p4-B	m1-L	m1-B	C-m1	p2-m1
dex	2.27	1.79	1.82	1.06	2.56	1.33	2.92	1.49	13.40	7.57
sin	2.66	1.86	1.40	1.08	2.65	1.29	3.02	1.58	13.49	7.84

marked as “*Panthera spelaea*, Pleistocene, Gailenreuth”. A handwritten label associated with one of the other three mounted skulls in the archive says (Fig. 6): “*Felis spelaea* Goldfuss, Schädel + UK [zweiter Schädel in Schausammlung] Jungquartär Gailenreuther Höhle, Franken, Coll. Rosenmüller, 118 Qu Kat. p. 64” (i.e. skull and mandible [second skull in the public collection] Upper Quaternary, Gailenreuther Cave, Franconia; collection Rosenmüller; 118, Source Catalog p. 64). Thus the skull from the public collection is also from the original Rosenmüller collection. The word “Coll” is clearly spelled with a capital “C” suggesting that the noun “Collection” and not the verb “collected by” is meant by the abbreviation. Apparently this specimen carried the number 118 and was listed in the original catalog of the Museum on page 64. The skull with the label has a cranium and both mandibles and is the one identified now by Diedrich (2008) as the missing

holotype. One of the other skulls has only a right mandible and one is mounted without mandibles.

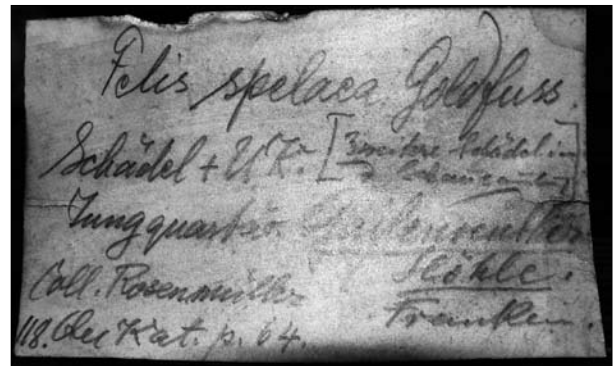


Fig. 6: Old museum label stating that the cave lion skull on display is from the Rosenmüller collection (Photo: S. Kempe).

## THE CAVE HYENA SKULL ON DISPLAY

The third skull of a fossil animal from the Berlin collection bearing the species name “*spelaeus/spelaea*” on public display is that of the cave hyena (modern archive No. MB 48104; Fig. 7). Skull and both mandibles are not mounted on a plaster support like the two others but are placed side by side on the board. Again, mandibles and skull do not fit together and do not derive from the same individual. The skull shows substantial sinter cover over the palate, suggesting, that it was deposited upside down protruding from the sediment (Fig. 8).

The cranium is well preserved and has a total length of 30.8 cm and a breadth at the zygomatic arches of 20.02 cm. The heights of the orbitae are 4.96 and 5.39 cm (right and left). The openings for the maxillary muscles measure (right) 8.5\*5.82 cm (length \* width) and (left) 7.92\*6.8 cm. The breadth of the condylii occipitales is 5.53 cm. The breadth of the maxilla at the canines and between the P4s is 7.8 and 13.64

cm, respectively, and the smallest breadth of the palate measures 4.05 cm. Two of the incisors (I2, I3 left), both canines and all premolars are preserved in the skull (for measurements see Tab. 3; Fig. 8). The teeth show heavy signs of abrasion (the abrasion area of left P4 measures for example 3.23\*1.95 cm on the lingual side of the tooth crown).

The left mandible (Fig. 9) is about 11 cm high and 18.05 cm long. The right mandible is damaged and only 16.34 cm long. Both mandibles have been glued together at the symphysis. All the incisors are missing. Only two alveoli are still visible, indicating that the hyena lost them in vivo a long time before it died. The right canine is missing and the left one is splintered and somehow looks foreign and might be a later addition to the mandible. Otherwise the three premolars and the molars are well preserved, but show strong abrasion (measurements see Tab. 3).



Fig. 7: Dorsal view of the cave hyena cranium from the Rösenbeck Cave (Germany) on display in the public collection (Photo: S. Kempe).



Fig. 8: Ventral view of the cave hyena cranium, note the flowstone cover of the palate (Photo: S. Kempe).



Fig. 9: Dorsal view of the mandibles of the cave hyena from Rösenbeck Cave (public collection) (Photo: S. Kempe).

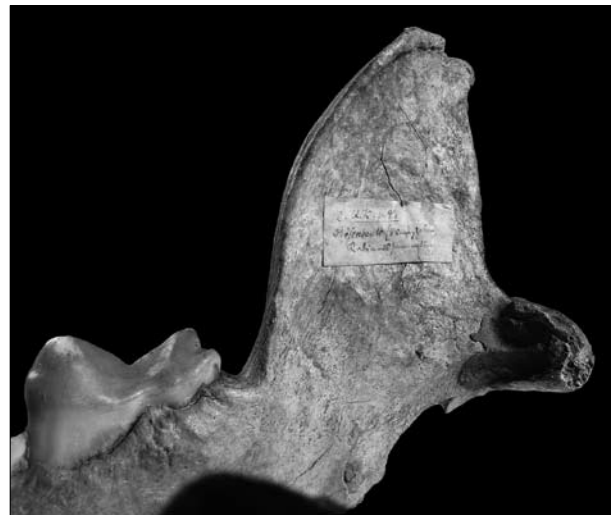


Fig. 10: Old provenience label on the inner side of the processus coronoideus of the cave hyena from the Rösenbeck Cave, Sauerland (Photo: S. Kempe).

Tab. 3: *Crocota crocuta spelaea*; teeth measurements (in cm) from Rösenbeck Cave (Humboldt Museum): Abbreviations: C – canine, P/p – premolar, m – molar, L – length, B – breadth.

<b>maxilla</b>	<b>C-L</b>	<b>C-B</b>	<b>P1-L</b>	<b>P1-B</b>	<b>P2-L</b>	<b>P2-B (max)</b>	<b>P3-L</b>	<b>P3-B (max)</b>	<b>P4-L</b>	<b>P4-B (min)</b>	<b>P1-P4</b>	<b>P3-P4</b>
Dex	1.87	1.35	0.78	0.83	1.77	1.24 (1.49)	2.28	1.32	4.35	2.21 (1.26)	9.11	6.62
Sin	1.95	1.35	0.88	0.77	1.85	1.23 (1.35)	1.95	1.23 (1.34)	4.23	2.13 (1.36)	8.66	6.27
<b>mandible</b>					<b>P2-L</b>	<b>p2-B</b>	<b>p3-L</b>	<b>p3-B</b>	<b>p4-L</b>	<b>P4-B</b>	<b>m1-L</b>	<b>m1-B</b>
Dex					1.50	1.10	2.20	1.52	2.40	1.42	3.01	1.31
Sin					1.42	1.09	2.18	1.51	2.33	1.41	3.10	1.30

In addition to the modern archive number, there is a sticker on the inner side of the right mandible, very

hard to read (Fig. 10): “2. UK p. 97 Rösenbeck ((1)810 ausgegraben (?) Kabinetsammlung”; i.e. translated:

“specimen two, lower jaw, p. 97 (probably of the mentioned older catalog) Rösenbeck 1810 excavated, cabinet collection”. Thus the skull of the Berlin hyena is from

Rösenbeck Cave near Brilon, Sauerland, Germany. The site was described by Nöggerath in 1846.

## ANOTHER ARCHIVED, MOUNTED CAVE BEAR SKULL FROM THE ROSENMÜLLER COLLECTION

In the archived collection of the Humboldt Museum several other cave bear skulls exist; at least two have associated mandibles. One impressively large specimen is from the Heinrichshöhle near Hemer (Sundwig), Sauerland, Germany (Archive No MA 5018). Skull and mandibles are joined together by wires, so that exact measurement will have to wait (Fig. 11). In this case both parts seem to belong together.



Fig. 11: Complete cave bear skull from the Heinrichshöhle near Hemer (Sundwig) from the archive of the Humboldt Museum (Photo: S. Kempe).

More intriguing was yet another cranium with both mandibles, mounted on plaster props just as the cave bear skull on display (MA 5017; Fig. 12). This one clearly is also from the Rosenmüller collection and therefore also of historical interest. Again, cranium and mandibles do not fit together. The mandibles are much darker in colour than the skull itself and show more abrasion.

The cranium is 41 cm long, the breadth at the zygomatic arches is 24 cm and the breadth minimum of the maxilla is 4.49 cm. The breadth of the condylii occipitales is 8 cm and the breadth of the foramen magnum measures 3.56 cm. The teeth C, P4, M1, and M2 are preserved on both sides. The breadth of the maxilla at the canines and of the maxilla between the M2 amounts to 10.3 cm and 10.75 cm, respectively (Fig. 13). Tab. 4 gives teeth sizes and some of the distances.

Both mandibles were formerly joined together, but the glue has given away and the two mandibles separat-

ed. The right mandible is 27.4 cm and the left one is 27.2 cm long, the processus coronoideus is missing. Both processi condylarii are slightly damaged (right > 5.5 cm, left > 5.65 cm). The following teeth are present: left: C, m1, m2, m3; right: C, p4, m2, and m3. The alveoli show that the missing teeth, also those of the incisors, were present



Fig. 12: Mounted cave bear cranium and mandible from the Zoolithen Cave originally from the Rosenmüller collection (archive of the Humboldt Museum) (Photo: S. Kempe).

in vivo. All teeth show medium abrasion. Teeth sizes are given in Tab. 4.

Both mandibles preserve the original stickers. The four-line label on the left jaw can still be read: “82 UK p. 63, Unterkiefer, Gaylenreuther Höhle, Coll. Rosenmüller”, the first line on the sticker on the right jaw has faded entirely but the last two can be guessed to read as “Gaylenreuther Höhle, Coll. Rosenmüller”. The cranium also carries an old paper patch, that is faded entirely except for the three letters “Gay...”, indicating that it also originates from the Zoolithen Cave at Gailenreuth. In more modern writing the archive number is added under the site specification “Gaylenreuther Höhle”, most probably re-inking an older inscription because “Gaylenreuth” is a very old-fashioned way of spelling. In addition the mandible carries an inscription in black ink reading “Ursus spelaeus” (Fig. 14). Since the bones are from Rosenmüller’s collection, the script may have been from his own hand.



Fig. 13: Ventral view of the cave bear cranium from the Zoolithen Cave with the well preserved teeth (Photo: S. Kempe).

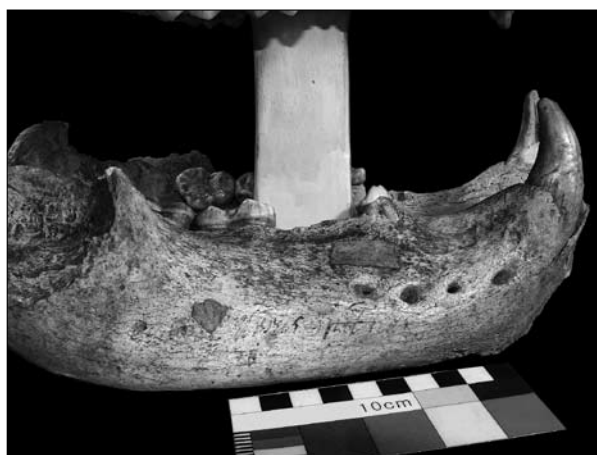


Fig. 14: Lateral view of the right mandible from the Zoolithen Cave with the faded old label and the ink inscription of "Ursus spelaeus" in old hand (Photo: S. Kempe).

Tab. 4: *Ursus spelaeus*; teeth measurements (in cm) from the Zoolithen Cave (Humboldt Museum): Abbreviations: C – canine, P/p – premolar, M/m – molar, L – length, B – breadth, d – diastem (distance between canine and premolar).

mandible	C-L	C-B	P4-L	P4-B	m1-L	m1-B (max)	m2-L	m2-B (max)	m3-L	m3-B (max)	p1-m3	C-m3	d
Dex	2.12	1.64	1.53	1.11			2.92	1.80 (2.01)	2.86	1.87 (2.20)	10.47	17.90	5.30
Sin	2.32	ca. 1.73			3.03	1.22 (1.7)	3.13	1.73 (1.85)	2.80	1.93 (2.15)	10.7	17.67	ca. 4
maxilla			P4-L	P4-B (min)	M1-L	M1-B (max)	M2-L	M2-B (min)			M1-M2	C-M2	
Dex	2.62	2.02	2.06	1.42 (1.13)	2.51	1.84 (1.86)	4.42	2.10 (1.85)			9.09	16.62	4.94
Sin	2.63	2.04	2.07	1.40 (1.03)	2.52	1.73 (1.88)	4.44	2.04 (1.92)			9.12	16.77	4.33

### THE "URSUS ARCTOIDEUS" SKULL

In the archive another interesting bear skull (MA 2680) is stored (Fig. 15). It is 41.5 cm long and has a low forehead. The zygomatic arches are missing. The teeth show strong abrasion; C, P4, M1, M2 are present on both sides. In addition, the alveoli of P1 and P3 are present (Fig. 16). All incisors are missing, except of the root of the left I3.

The most interesting fact about this skull is the old three-line sticker reading: "15 OK p. 58; Schädel des Ur-

sus arctoides; Blmb." i.e. the cranium of the species *U. arctoides* that Blumenbach tried to establish as a separate species. The sticker does not reveal where the skull is from. Some of the circumstances associated with the *U. arctoides* story are reported in Kempe *et al.* (2005).





Fig. 15: Cave bear cranium of “*Ursus arctoides*” from the archive of the Humboldt Museum. Note the relatively flat forehead (Photo: S. Kempe).



Fig. 16: Ventral view of the “*Ursus arctoides*” with the alveoli of premolar 1 and 3. Note old label (Photo: S. Kempe).

### THE “CANIS LUPUS SPELAEUS” SKULL

Even more intriguing is the skull of a wolf (MA 2001; Fig. 17). It is mounted on plaster props, similar to those of the cave lions, and the separate old card board label with the printed line “Geol.-Paläont. Mus. Berlin” reads: “446. Qu Kat. p. 100 No 1. *Canis lupus spelaeus* Gf. Calvarium. Diluv. Gailenreuter Höhle Franken, Coll. Rosenmüller”. Thus the skull is also from the Rosenmüller collection and represents the *Canis lupus spelaeus* that Goldfuß (abbreviated here as Gf) tried to establish as a separate species in 1823 (Goldfuß 1823).



Fig. 17: Mounted skull of a wolf identified as “*Canis lupus spelaeus*, Goldfuß” from the Zoolithen Cave. Note separate old card-board label identifying the specimen as derived from the Rosenmüller collection (Photo: S. Kempe).

### CONCLUSIONS

This first, and admittedly superficial inspection of the “*spelaeus* species” (*Ursus*, *Crocota*, *Panthera*, *Lupus*) stored at the Humboldt Museum in Berlin showed that several fossils are from Rosenmüller’s original collection. It is known that his collection has been scattered widely. Specimens are, for example, known to us from the collections in the museums and institutes of Erlangen, Bonn, Bayreuth, Monaco, Bottrop, Bamberg, London, and Paris. Two card board labels and several old stickers identify at least four of the Berlin fossils as derived from this famous collection. They also mention a catalog abbreviated as “Qu Kat”,

i.e. a “Quell-Katalog” or source catalogue, that was kept by the Museum and that carried information as to the provenience of the pieces and that is either lost or currently unavailable.

At least one of the complete cave bear skulls in the archive is from Rosenmüller’s Zoolithen Cave collection. When compared (Fig. 12) to the original copperplate (Fig. 1) it is clearly not the holotype. The skull in the public collection that at first view is very similar to Rosenmüller’s skull (in as much as it has much abraded molars) originates from L’Herm in France and therefore cannot be the holotype either.

At least two of the cave lion skulls originated from the Rosenmüller collection (and possibly all four of them) as well. It is known from the literature (Goldfuß 1810, footnote page 278) that Rosenmüller was planning to publish a paper about the cave lion. Therefore the cave lion skulls in the Berlin collection might be those specimens that Rosenmüller wanted to use for the description of the cave lion. Rosenmüller never finished this publication and, in 1810, Goldfuß named the cave lion "*Felis spelaea*" without actually describing it in detail, apparently not wanting to interfere with Rosenmüller's plans. When comparing the Goldfuß picture of the cave lion skull with the skull in the public collection, it appears that it is missing the incisors while the Goldfuß-holotype clearly has incisors present in the cranium. One of the other skulls may, according to Diedrich (2008), be the missing holotype, even though the comparison of it with the copper plate leaves a certain amount of doubt about this parallelization.

The cave hyena skull on display is from the Rösenbeck Cave, Sauerland, and therefore also not identical with the skull that Goldfuß used to establish the cave hyena as a separate species in 1823. Nevertheless, this is a very interesting observation because Nöggerath (1846) described the Rösenbeck Cave as a typical hyena den

cave that delivered several well preserved hyena skulls. First opened by road work, it was excavated in 1830 more thoroughly according to Nöggerath's notes. So far none of these skulls seems to have been published in detail. If the reading on the label with (1)810 is correct, the skull would be one of the first ones to have been taken from the cave, a fact in accordance with the flowstone cover on the palate, suggesting that it was partly exposed above the sediment.

Most intriguing is the complete skull of a wolf in the archive. This specimen is also from Rosenmüller's Collection from the Zoolithen Cave and may be a missing holotype; however, of a species that never was accepted as such.

Very interesting is also the "*arctoides*" skull in the Humboldt Museum Archive. Due to the fact that it displays alveoles of the P1 and P3, it might turn out to be a fossil *Ursus arctos* skull.

Overall, we still can learn a lot by the inspection of archived vertebrate fossils, specifically when the old labels reveal their provenience. The specimens from the Zoolithen Cave and from the Rösenbeck Cave at the Humboldt Museum in Berlin merit further attention and certainly should be included in future DNA studies.

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