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## Brown bear Finds from Caves in the Alpine region

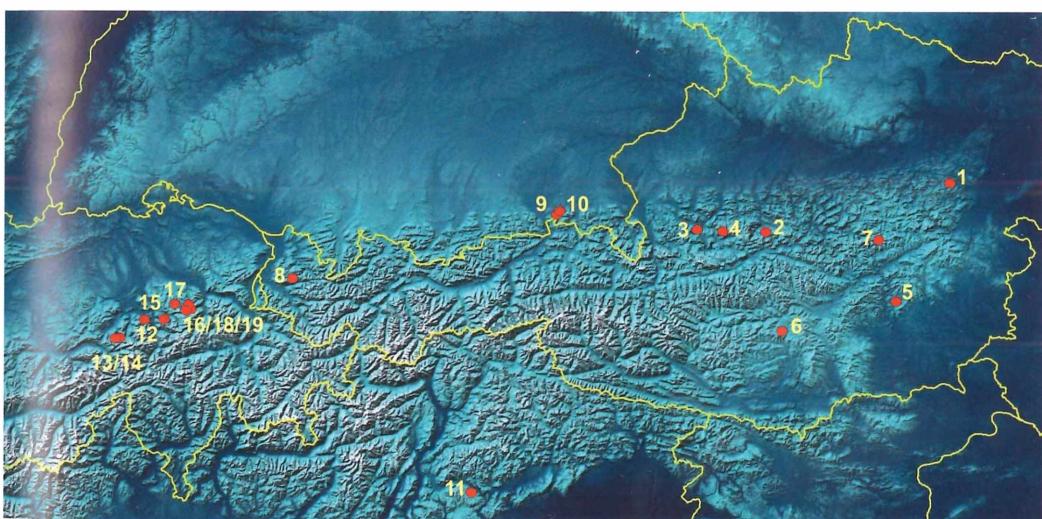
### Zusammenfassung:

Die beschriebenen Braunbärenfunde stammen aus Österreich, Deutschland, Italien und der Schweiz. 18 Knochenproben wurden mit der  $^{14}\text{C}$ -Methode (AMS oder konv.) und eine mit der U/Th-Methode datiert. Es erfolgt eine Kurzbeschreibung der Fundstellen mit Angaben zum Braunbärenfund und zur Datierung. Anschließend werden die 19 alpinen Braunbärenfunde, die vom Übergang des Pleistozäns zum Holozän bis ins Mittelalter reichen, im klimatischen Kontext dargestellt und paläobiologische Aspekte besprochen.

### Abstract:

Nineteen sites of dated brown bears from Alpine regions of Austria, Germany, Italy and Switzerland are described. Samples have been dated by  $^{14}\text{C}$ -method (AMS or conv.). One specimen has been dated by U/Th-method. For each find, a description of the site, dating and the context of the find are given. The age of the finds range from Pleistocene/Holocene transition into the Middle Ages. The climatic context and palaeobiological aspects are discussed.

Fig. 1: Map of dated brown bear sites from the Alpine Region (numbers see text) after DÖPPES & PACHER (2005).



## Résumé:

Les restes d'ours brun décrits dans cet article proviennent d'Autriche, d'Allemagne, d'Italie et de Suisse. 18 échantillons osseux ont été datés à l'aide de la méthode  $^{14}\text{C}$  (à accélération de particules ou conventionnelle) et un par l'U/Th. Une courte description des sites est donnée, suivie par les résultats des datations et la description du contexte dans lequel les pièces ont été trouvées. Le contexte climatique des pièces, dont l'âge varie entre la limite entre le Pléistocène et l'Holocène et le Moyen-Age, ainsi que leurs aspects paléobiologiques sont discutés.

**Key words:** *Ursus arctos*, Alpine region, Pleistocene/Holocene transition until the Middle Ages

## Introduction

Brown bears (*Ursus arctos* L.) are loner and „hiker“; they need large, contiguous woodlands. Some bears hibernate in caves, while others spend the winter month in crevices or beneath roots of fallen trees. At this time, females give birth to their cubs. The litter consists mostly of two to three bears, which remain two years with the mother. The biggest carnivore of Central Europe feed on berries, honey, roots, carrion, fish, mice, marmots and many different plants (JAKUBIEC 1993). Brown bears became almost extinct in Central Europe. The brown bear in Austria could be successfully reintroduced more than 10 years ago. The population contains today 25 to 30 individuals (RAUER et al. 2001). In Italy, he is native in the Trentino and in the Abruzzi. In Germany, the brown bear became extinct in 1835, and from Switzerland the last known bear observation was in 1923 (KORA 1999).

## Sites

Each site is mentioned in the following text according to countries and regions, respectively. The serial numbers of the sites correspond to the numbers used in the general map (Fig. 1). For each site, the geographical position, situation of the finds as well as exact information on the brown bear remains and the dating are given.

The following abbreviations are used:

AT - Allander Tropfsteinhöhle, GIZ - Institute of Geographic, University of Zurich, Gd - Gliwice Radiocarbon Laboratory, Poland, Kat.no. - local cave register number, NISP - number of identified specimens, MNI – minimum number of individual

### Allander Tropfsteinhöhle (1), Austria

The Allander Tropfsteinhöhle (Kat.no. 1911/2) is located at the northern slope of the ‘Große Buchberg’, south of Alland, in the Wienerwald, Lower Austria.

Forty years after the discovery of a brown bear skeleton, the entire faunal remains were studied for the first time (DÖPPES & FRANK 1997). In August

2002, big stones that were stuck under the visitor platform of the show cave fell off, and tore the platform of the brown bear skeleton from its fastening. In course of a re-examination of each single bone, all well preserved bones of the brown bear were measured. Only the forefeet of the left side were broken (DÖPPES & FRANK 1997).

*Ursus arctos*: 1 MNI (NISP 99), female, adult, measurements see DÖPPES & FRANK (1997) and Table 2, 3, 4, 6, 7

Dating:  $10,870 \pm 80$  a BP (DÖPPES & FRANK 1997; see also Table 1)

### **Gamssulzenhöhle (2), Austria**

The Gamssulzenhöhle (Kat.no. 1637/3) is located at the northern slope of the ‘Seespitz’, southwest of Windischgarsten, Upper Austria.

Brown bear bones were already found in course of the first investigations at Gamssulzenhöhle (EHRENBURG 1962). A palaeontological and archaeological excavation campaign lasted from 1988 to 1991 (RABEDER 1995). Brown bear bones were collected from the surface at the back of the entrance hall (later: excavation area 3). An undetermined bear bone was dated to the Holocene, so the find is listed as „*Ursus arctos*?“ (RABEDER 1995: Table 1). Later on, further remains of brown bears were excavated at the same find spot.

Dating:  $10,800 +800/-2,500$  a BP (RABEDER 1995; see also Table 1)

### **Laufenbergloch (3), Austria**

The Laufenbergloch (Kat.no. 1565/11) is located at the northern slope of the ‘Laufenberg’, southwest of Bad Ischl, Upper Austria.

In 1985 and 1986 two skulls and additional bones of a brown bear were found by a forest ranger. During a first visit to the cave in 1995 by members of the Institute of Palaeontology (University of Vienna), new material could be collected for radiometric dating (DÖPPES 1999).

*Ursus arctos* (DÖPPES 1999): MNI 2 (NISP 13), female, adult, gnaw marks; measurements see Table 2, 3, 4

Dating:  $9,810 \pm 70$  a BP (DÖPPES 1999; see also Table 1)

### **Wolfhöhle (4), Austria**

The Wolfhöhle (Kat.no. 1623/145) is located at the northwestern side of the ‘Vorderen Schwarzmooeskogel’, northeast of Altaussee, Styria.

An almost complete brown bear skeleton was excavated by members of the ‘Verein für Höhlenkunde in Obersteier’ (Bad Mitterndorf), approx. 60 m inside the cave, at the bottom of a 20 m deep abyss („wolf chamber“). The bones of the left side of the body show numerous pathologies caused by the fall. The animal must have survived the accident for some time (WITHALM 1998).

*Ursus arctos* (WITHALM 1999): MNI 1 (NISP 162), male, 5-6 years

Dating:  $6,615 \pm 45$  a BP (see Table 1 and DÖPPES & PACHER 2005)

### **Eichberghöhle (5), Austria**

The Eichberghöhle (Kat.no. 2836/232) is located at the northern slope of the ‘Eichberg’-mountain, northwest of Semriach in the ‘Grazer Bergland’, Styria.

In 1995, H. Kusch and E. Oswald collected brown bear bones and other faunal remains from reddish sediment.

*Ursus arctos*: MNI 1 (NISP 11), subadult; measurements see Table 3, 4

Dating:  $2,695 \pm 45$  a BP (see Table 1 and DÖPPES & PACHER 2005)

### **Wildes Loch (6), Austria**

The Wildes Loch (Kat.no. 2743/1) is located at the ‘Grebenzen’ near St. Lambrecht, Styria.

In 1856 and 1857, the pit was investigated for the first time and bones of several species including a skeleton of a brown bear were found (AICHHORN & PLANKENSTEINER 1875). Today, the skull and some other bones of the bear are missing.

*Ursus arctos*: adult, MNI 1 (NISP 21), male; measurements see Table 3, 4, 5, 7

Dating:  $1,210 \pm 30$  a BP (see Table 1 and DÖPPES & PACHER 2005)

### **Feistringhöhle (7), Austria**

The Feistringhöhle is located at the southern side of the Feistringstein in the Hochschwab mountain region, Styria.

In course of the discovery in 1963, bones of three brown bears, one medieval arrowhead, and charcoal remains were found (FRIEDL 2000). It is assumed, that one of the bears was injured during a hunt in medieval times and fled into the cave, where he died. The dated bone, however, comes from one of the other bears that must have died in the cave during the Bronze Age.

*Ursus arctos*: MNI 3 (FRIEDL 2000)

Dating:  $2,935 \pm 25$  a BP (Table 1 and DÖPPES & PACHER 2005)

### **Bärenhöhle at Reuthe (8), Austria**

The Bärenhöhle (Kat.no. 1114/001) is located at the Dürrenberg ob Reuthe at Bezau (Bregenzerwald), Vorarlberg.

During the rediscovery of the cave in 1921 bones of a brown bear were excavated.

Dating:  $2,830 \pm 30$  a BP (Table 1 and DÖPPES & PACHER 2005)

### **Neue-Laabenstein-Bärenhöhle (9), Germany**

The Neue-Laabenstein-Bärenhöhle (Kat.no. 1341/33) is located at the Laabenstein mountain near Frasdorf, southeast of Rosenheim, Bavaria.

After the discovery in 1996, test excavations took place in hall 1 (DARGA & ROSENDALH 2001) and in the ‘Kriechgang’ near the entrance (DARGA et al. 2005).

Several remains of brown bears were found in the test excavation in the ‘Kriechgang’ (DARGA et al. 2005): 1 female (NISP 10) and a young bear approx. 12 months old (NISP 8)

Dating ‘Kriechgang’:  $11,872 \pm 92$  a BP (DARGA et al. 2005; see also Table 1)

### **Schlüssellochhöhle (10), Germany**

The Schlüssellochhöhle (Kat.no. 1341/1) is located near the Neue-Laibenstein-Bärenhöhle (9), southeast of Rosenheim, Bavaria.

In 1933, a skeleton of a brown bear was excavated, approx. 130 m away from the entrance. Additional collecting of bones occurred in 1993 (DRIESCH & VAGEDES 1994).

*Ursus arctos* (DRIESCH & VAGEDES 1994): MNI 1 (NISP 90), male, adult

Dating:  $10,055 \pm 33$  a BP (DRIESCH & VAGEDES 1994; see also Table 1)

### **Grotta d'Ernesto (11), Italy**

The Grotta d'Ernesto is located at Valsugana, south of Grigno (Trento). A skeleton of a brown bear (RIEDEL 1994) was found at the back of the cave (Camera della Torgia). Mesolithic remains are also known from this cave.

*Ursus arctos* (RIEDEL 1994): MNI 1, male, 2.5 to 5 years old

Dating:  $11,900 \pm 200$  a BP (AWSIUK et al. 1994; see also Table 1)

### **Schwalmis-Bärenhöhle (12), Switzerland**

The Schwalmis-Bärenhöhle is located at the northern slope of the Schwalmis (Nidwaldner Voralpen) in the municipality of Emmetten (Canton Nidwalden).

In 1965, the cave was explored for the first time. At the deepest position of the cave ('Bärenfalle') an almost complete brown bear skeleton and scratch marks in the loam were discovered. The bear fell into the pit and tried to climb up again. The broken left lower jaw was probably caused by the fall.

*Ursus arctos* (BLÄTTLER et al. 1995): 1 MNI, female, approx. 12 to 14 months

Dating:  $5,850 \pm 65$  a BP (BLÄTTLER et al. 1995; see also Table 1)

### **Bärenhöhle auf Bettenalp (13), Switzerland**

The Bärenhöhle auf Bettenalp (Kat.no. M13) is located at the region of the Melchsee-Frutt (Obwaldner Voralpen) near the Bettenhöhle (Canton Obwalden).

The pit was discovered in 1984. Twelve years later, a brown bear skeleton was found at the bottom of the pit (TRÜSSEL & MOREL 1997).

*Ursus arctos* (TRÜSSEL & MOREL 1997): 1 MNI (NISP 55), female?, approx. 12 to 14 months, gnaw marks

Dating:  $2,420 \pm 80$  a BP (TRÜSSEL & MOREL 1997; see also Table 1)

### **Bärenhöhle am Schwarzhorn (14), Switzerland**

The Bärenhöhle am Schwarzhorn (Kat.no. S3) is located at the region of the Melchsee-Frutt (Obwaldner Voralpen) near the Fikenloch (Canton Obwalden).

The small cave with an overall length of 31 m was discovered in 1979. During the survey, two bone fragments and two teeth of a brown bear were found (TRÜSSEL & MOREL 1997).

*Ursus arctos* (TRÜSSEL & MOREL 1997): 1 MNI (NISP 4), 10 to 12 months

Dating:  $1,665 \pm 55$  a BP (TRÜSSEL & MOREL 1997; see also Table 1)

### **Bärenhöhle am Stoos (15), Switzerland**

The Bärenhöhle am Stoos is located at the northern slope of the Stooshorn in the Muotatal (Canton Schwyz).

Already in the summer 1860, a hunter found six complete brown bear skeletons of different age. The bone material is missing. In course of the rediscovery and investigation of the cave in 1991 and 1993 some smaller bones were collected. The brown bear bones are from at least five individuals (AUF DER MAUR sen. & MOREL 1995).

*Ursus arctos* (AUF DER MAUR sen. & MOREL 1995): MNI 5 (NISP 35), 3 adult, 1 bear approx. 1-1.5 year old, 1 juvenile

Dating:  $5,260 \pm 65$  a BP (AUF DER MAUR sen. & MOREL 1995; see also Table 1)

### **Höhle 92/2 (16), Switzerland**

The cave is located at the Bödmerenwald east of Muotatal (Canton Schwyz). In course of the discovery and investigation of the cave in 1992 and 1993, weathered bones of a bear were found. The remains probably belong to an old female (AUF DER MAUR sen. & MOREL 1995).

*Ursus arctos* (AUF DER MAUR sen. & MOREL 1995): MNI 1 (NISP 46), senile, female?

Dating:  $9,700 \pm 80$  a BP (AUF DER MAUR sen. & MOREL 1995; see also Table 1)

### **Nonstopschacht (17), Switzerland**

The Nonstopschacht is located at the southern slope of the Bietstock, Muotatal (Canton Schwyz).

The cave system was discovered in 1991 and investigated in 1993 up to a depth of 133 m. Three bear bones were found at the almost deepest position of this complex cave system consisting of pits and corridors. The remains probably come from an injured bear. Single bones from this individual have been transported by water or debris movement (AUF DER MAUR sen. & MOREL 1995).

*Ursus arctos* (AUF DER MAUR sen. & MOREL 1995): MNI 1 (NISP 3), juvenile, approx. 7-8 months

Dating:  $5,980 \pm 60$  a BP (AUF DER MAUR sen. & MOREL 1995; see also Table 1)

### **Bärenfalle Silbern (18), Switzerland**

The Bärenfalle is located at the Vorderen Silbern, east of Muotatal (Canton Schwyz).

The phreatic cave system is yet not entirely explored (IMHOF 2002/03). The total length is 204 m (BETSCHART 2004). Bones and teeth of a juvenile brown bear were found. Only the metacarpal and metatarsal bones are completely preserved (IMHOF 2002).

*Ursus arctos* (IMHOF 2002): MNI 1 (NISP approx. 60), juvenile

Dating:  $7,845 \pm 70$  a BP (BETSCHART et al. 2001; see also Table 1)

## Milchbalm-Höhle (19), Switzerland

The Milchbalm-Höhle is located at the Silbern, in the valley of Chalber, east of Muotatal (Canton Schwyz).

After the discovery of the cave in 1999, bones of brown bear, ibex, and red deer were dated (IMHOF 2003). The remains from brown bear are from one individual. No further information could be found.

*Ursus arctos* (AGH 2003): MNI 1

Dating:  $9,690 \pm 75$  a BP (IMHOF 2002/03; see also Table 1)

Brown bear skeletons from three caves in France were used to supplement our measurements. The brown bear remains come from the pit Gouffre de Genieux, near St. Pierre de Chartreuse, north of Grenoble (Isère), from a cave at Saint-Jean-de-Sixt, east of Annecy (Haute-Savoie), and from the cave Croix de Jaume near Lans-en-Vercors, west of Grenoble (Isère). The French brown bear remains are preserved in the collection of Bernard Reffienna in St. Pierre-de-Chartreuse. The material from the cave at Saint-Jean-de-Sixt was collected in 1994 and from the cave Croix de Jaume in 1983. The date of the recovery of the finds from the Gouffre de Genieux is not known anymore. The material was studied and measured in September 2004 (see Table 2-7).

## Interpretation and discussion

Nineteen sites of brown bears are dated by radiocarbon method. The produced ages reach from the Pleistocene/Holocene transition until the Middle Ages. The first evidence of brown bears in the Alpine region after the Last Glacial Maximum comes from the southern Alpine site Grotta Ernesto and from the northern Alpine site Neue-Laabenstein-Bärenhöhle. The bear dates correspond to the Bölling-Alleröd-warming. From the Younger Dryas cold event there are no data. The radiometric dating from the Gamssulzenhöhle was determined by means of U/Th-method and shows a large range of error (Table 1). Nevertheless, the dating falls into the beginning of the Holocene. No brown bear data are known from the cold snap around 8.2 ka. The „optimum“ of the Holocene (Atlanticum) is with six dates well documented. The third gap of our data record is in the Subboreal. From the end of the Subboreal (Bronze Age) the data record is documented continuously to the Middle Ages. Further studies will have to show, if the obtained distribution was only caused by the still relative small number of dated sites (Table 1).

Brown bear remains were found in pits and horizontal caves. In each pit one single individual came to death. These natural traps are either particular karstic features (e.g. Wolfhöhle, Wildes Loch, Bettenalp, Schwalmis-Bärenhöhle) or are part of a larger cave system (e.g. Allander Tropfsteinhöhle, Nonstopschacht, Schlüssellochhöhle).

Finds of brown bears from animal pits are located from 1,275 m to 1,979 m above sea level. Only the Allander Tropfsteinhöhle (Lower Austria) is located in 400 m above sea level. Both, young animals and full-grown

bears are found in animal pits. The bears might have fallen in during the search for a protected place for the winter.

In the horizontal cave systems several individuals are documented who used the cave at different times as hibernation places. Only the female and the one-year old bear from the NLB (DARGA et al. 2005) might have hibernated together because young bears stay two years with their mothers. From the highest situated caves (Vordere Silbern and Bärenhöhle am Schwarzhorn) a young animal is documented which did not survive the second winter.

Investigations of hibernation caves of modern brown bears in the French Pyrenees showed, that altitudes between 1000 m and 2000 m a.s.l. are favoured (FOSSE et al. 2004). Also the numerous brown bear finds of the Mont Ventoux (Southwest France) come from 1.300 m to 1.600 m a.s.l. (CREGUT-BONNOURÉ et al. 2003). At the Mont Ventoux currently fourteen pits with bones of 190 individuals are known. The age of the finds reach from the Neolithic period to the Antiquity. 16 brown bear caves of the Alpine region are located from 1,130 m to 2,070 m a.s.l..

In course of preservation of species and reintroduction of modern bears in different areas, genetically distinct populations became investigated. In Europe, a western and an eastern group can be distinguished by means of mtDNA analysis. The western group is, for example, represented in Slovenia and Trentino while the eastern group occurs in Russia, Estonia and northern Sweden. In Romania both groups are represented (TABERLET & BOUDET 1994; KOHN et al. 1995). First investigations of Upper Pleistocene brown bears showed also two groups in the Alpine region (HOFREITER et al. 2004). Late Glacial and Holocene bear finds fill the phylogenetic gap between the fossil and modern genetic bear groups.

A first result of a DNA analysis of a subfossil brown bear from France shows a narrow relationship with now-living bears from Slovenia and Trentino (KUEHN et al. 2001). A sample of a bear bone from the Allander Tropfsteinhöhle was sent for genetic investigations to the „Department of Evolutionary Genetics“ at the Max-Planck Institute at Leipzig (Dr. M. Hofreiter).

In order to reconstruct a more precise distribution of different brown bear populations in the Late Pleistocene/Early Holocene further radiometric dating and DNA analyses are necessary.

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No.	site	a.s.l.	Lab.-no.	method	material	$\delta^{13}\text{C}$ -value (‰)	a BP
1	Allander Tropfsteinhöhle	400	VRI-1438	conv. $^{14}\text{C}$	calcaneus	-20.2	8,920 $\pm$ 80
2	Gamszulenhöhle	1,300	VRI-GSI	US			10,800 +800/-2,500
3	Laufbergloch	1,445	GrN-22339	conv. $^{14}\text{C}$	metapodial		9,810 $\pm$ 70
4	Wolfshöhle	1,687	VERA-0836	AMS $^{14}\text{C}$	phalanx II	-22.2 $\pm$ 1.4	6,615 $\pm$ 45
5	Eichberghöhle	850	VERA-1386	AMS $^{14}\text{C}$	metapodial	-25.8 $+/-1.4$	2,695 $\pm$ 45
6	Wildes Loch	1,796	VERA-2192	AMS $^{14}\text{C}$	metapodial	-20.0 $+/-1.0$	1,210 $\pm$ 30
7	Feistringhöhle	1,675	VERA-2193	AMS $^{14}\text{C}$	humerus	-19.9 $\pm$ 1.9	2,935 $\pm$ 25
8	Reuthe	887	VERA-2231	AMS $^{14}\text{C}$		-20.0 $\pm$ 0.5	2,830 $\pm$ 30
9	Neue-Laubenstein-Bärenhöhle	1,300	GrA-13379	AMS $^{14}\text{C}$	tibia	-21.0	10,140 $\pm$ 50
10	Schlüssellochhöhle	1,275	Hd 16885-16378	conv. $^{14}\text{C}$	ribs		10,055 $\pm$ 33
11	Ernesto	1,130	Gd-6182	conv. $^{14}\text{C}$	ulna		11,900 $\pm$ 200
12	Schwalmis-Bärenhöhle	1,680	ETH-11359	AMS $^{14}\text{C}$	humerus		5,859 $\pm$ 65
13	Bettenalp	1,840	ETH-16267	AMS $^{14}\text{C}$	femur		2,420 $\pm$ 80
14	Schwarzhorn	2,450	ETH-16266	AMS $^{14}\text{C}$	parietal bone		1,665 $\pm$ 55
15	Bärenhöhle am Stoos	1,165	ETH-12783	AMS $^{14}\text{C}$	ribs		5,260 $\pm$ 65
16	Höhle 92/2	1,455	ETH-12785	AMS $^{14}\text{C}$	2 long bone fragments	9,700 $\pm$ 80	
17	Nonstopschacht	1,979	ETH-12784	AMS $^{14}\text{C}$	pelvis		5,980 $\pm$ 60
18	Bärenfalle, Silbern	2,070	GIZ	AMS $^{14}\text{C}$			7,845 $\pm$ 70
19	Milchbalm-Höhle	1,622	GIZ	AMS $^{14}\text{C}$	rib		9,690 $\pm$ 75

Table 1: List of radiometric data from Alpine brown bear sites.

	site	tooth	L	B
TL	AT	AT	17.20	12.10
BL	273.2	AT	16.40	12.00
Pail	150.2	Eichberghöhle	20.4	14.0
P4-M2	64.1	LB-2842/1	19.60	13.80
ML teeth	49.0	LB-2842/1	19.0	14.20
MBr	126.7	<b>NLB-005</b>	<b>16.3</b>	<b>11.70</b>
CoccBr	58.3	Genieux1	C	12.5
FmBr	<b>32.3</b>	Eichberghöhle	p4	12.5
ZBr	<b>183</b>	Wildes Loch	p4	12.9
scCBr	71.2	Genieux1	p4	12.5
FBr	90.7	Eichberghöhle	m1	23.5
sPalBr		Wildes Loch	m1	11.1
PalBr	80.3	Genieux1	m1	11
CranH	79.4	Eichberghöhle	m2	24.0
		Wildes Loch	m2	24.6
		Eichberghöhle	m3	21.3
		Genieux1	m2	22.3

Table 2: *Ursus arctos*; measurements of the cranium from the localities Allander Tropfsteinhöhle (AT), Laufenbergloch (LB), Gouffre de Genieux.  
 BL..basal length, CoccBr..breadth condylar occ., CranH..cranium height, EE..breadth entorbita,  
 FBr..breadth frontale, FmBr..breadth foramen magnum, MBr..mastoid breadth, ML teeth..molar  
 length, PalBr..breadth palatinum, Pail.. palatinum length, sCBr..smallest cranium breadth,  
 sPalBr..smallest palatinum breadth, TL..total length, ZBr..breadth zygomatic arches  
**Bold** - already published (see DÖPPES & FRANK 1997; DÖPPES 1999).

Table 3: *Ursus arctos*; measurements of the teeth of the upper jaw from  
 the localities Allander Tropfsteinhöhle (AT), Eichberghöhle, Laufen-  
 bergloch (LB), Neue-Laubenstein-Bärenhöhle (NLB), and Wildes Loch.  
**Bold** - already published (see DARGA et al. 2005).

site	Hm1	I-m	m3-p1	p4-m3	PL	ML
AT	36.7			74.1		63.5
AT	35.0					
Eichberghöhle	40.2	138,9		81.1		
LB-2842/1	40.3				42.6	66.2
LB-2842/1	39.7				43.1	65.3
LB-2842//2	41.7	<b>130.7</b>			41.5	65.4
Wildes Loch	40.6		80.4			
Genieux1			73.2			64.2

Table 4: *Ursus arctos*; measurements of the mandible from the localities Allander Tropfsteinhöhle (AT), Eichberghöhle, Laufenbergloch (LB), Neue-Laabenstein-Bärenhöhle (NLB), Wildes Loch and Gouffre de Genieux. **Bold** - already published (see DÖPPES 1999).

site	bone	TL	Bp	Dp	Bd	SD	Bt	Dc
Wildes Loch	hum	344	36	79.1	99.5	32.8	70.4	
CdJ	hum	355	68.9		86.4			
Genieux1	hum	277	58.5	67.6	83	25.1	55	
Genieux1	hum	276	60	68	84.3	25.7	55.2	
Sixt	hum				82.7	25.3		
Sixt	hum				83.5	25.8		
Wildes Loch	rad	302	44.4		61.1	24.5		
Genieux1	rad	262	34.5		50.8	22.8		
Genieux1	rad	263	32		51.6	22.4		
Sixt	rad	253.4	36.8		50.6			
Sixt	rad	252	37.1		51.7			
Wildes Loch	fem	403	100		82	35.4		46.6
Wildes Loch	fem	404	100		82.4	35.2		46
CdJ	fem	427	106.5		83.4			
CdJ	fem	431	108.8		83.8			
Genieux1	fem	335	79.8		67	29.2		39.4
Genieux1	fem	332	81.8		68.1	28.3		39.6
Sixt	fem				69	27.8		
Sixt	fem	329.6	80.3					39.2
Wildes Loch	tib	292	86.9		60.6	26.3		
Wildes Loch	tib	291	85.9		61.3	26.3		
CdJ	tib	310	80.8		63.6			
Genieux1	tib	252	69.8		52.6	21.3		
Sixt	tib	237.4			50.9			
Sixt	tib	237.6	74		50.6			

Table 5: *Ursus arctos*; measurements of the long bones from the localities Wildes Loch, Croix de Jaume (CdJ), Gouffre de Genieux and the cave at Saint-Jean-de-Sixt (Sixt).

site		L	Bpmax	Dp	Bdmax	Dd	SD
AT	Mc I	66.60	18.30	17.40	15.20	12.40	
NLB	Mc I	61.30	18.00	17.30	15.00	11.90	9.30
CdJ	Mc I	77.20	24.60	19.90	19.00	15.50	11.90
Genieux1	Mc I	64.40	19.00	14.90	13.60	12.70	8.90
Genieux1	Mc I	65.60	19.80	16.10	15.20	13.50	10.00
AT	Mc II	79.00	16.30	21.40	19.10	16.50	11.60
CdJ	Mc II	84.20	17.50	24.60	21.30	17.20	12.40
CdJ	Mc II	84.80	19.00	24.60	21.60	16.90	13.10
Genieux1	Mc II	73.40	13.10	18.50	16.30	14.80	10.60
Genieux1	Mc II	74.50	13.20	19.20	18.20	15.90	11.80
AT	Mc III	77.10	16.10	22.90	17.60	13.90	11.30
CdJ	Mc III	85.70	16.80	25.10	21.60	18.40	12.40
CdJ	Mc III	90.20	19.30	25.40	22.00	18.10	15.10
CdJ	Mc III	77.50	15.20	22.00	17.20	14.90	10.90
Genieux1	Mc III	77.40	14.80	21.60	17.70	16.00	11.00
AT	Mc IV	78.10	14.70	22.30	18.90	15.50	11.20
AT	Mc IV	77.70	14.50	22.50	18.40	15.40	11.40
CdJ	Mc IV	88.20	18.80	25.10	20.50	18.00	13.80
CdJ	Mc IV	87.00	17.40	26.30	21.60	17.40	13.20
Genieux1	Mc IV	76.00	13.40	19.90	16.70	14.70	10.40
Genieux1	Mc IV	78.80	16.10	22.70	18.40	15.70	12.00

Table 6: *Ursus arctos*; measurements of the metacarpalia from the localities Allander Tropfsteinhöhle (AT), Neue-Laubenstein-Bärenhöhle (NLB), Croix de Jaume (CdJ), Gouffre de Genieux and the cave at Saint-Jean-de-Sixt (Sixt).

site		L	Bpmax	Dp	Bd	Dd	SD
AT	Mt I	73.60	19.70	16.80	16.60	14.40	10.00
AT	Mt I	72.60	20.10	16.10	16.70	14.50	9.60
CdJ	Mt I	71.00	19.60	16.50	14.10	13.80	10.50
CdJ	Mt I	70.50	20.20	16.10	13.70	13.80	10.00
Genieux1	Mt I	59.20	17.30		13.50	11.40	8.20
Wildes Loch	Mt III	81.90	17.80			15.70	13.75
CdJ	Mt III	84.40	18.40	27.10	18.50	16.40	13.30
CdJ	Mt III		17.80	27.60	20.10	16.10	13.50
Genieux1	Mt III	75.00	14.10		15.60		10.60

Table 7: *Ursus arctos*; measurements of the metatarsalia from the localities Allander Tropfsteinhöhle (AT), Wildes Loch, Croix de Jaume (CdJ) and Gouffre de Genieux.

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