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![Vinoteca](image1)
![Ursus ladinicus](image2)
![Das neue Autonomiestatut](image3)
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![PROVINCIA AUTONOMA DI BOLZANO ALTO ADIGE](image5)

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![AUTONOME PROVINZ BOZEN SÜDTIROL](image9)
![PROVINCIA AUTONOMA DI BOLZANO ALTO ADIGE](image10)
Above: Cirque in the Cunturines opening to the East with the entrance of Conturines cave, at an altitude of 2,740 m a.s.l. Photo: G. Withalm

Below: Reconstruction of the area around Conturines cave during the phase of inhabitation by *Ursus ladinicus* RABEDER et al., 2004. Graphics: N. Frotzler
PROGRAM

Thursday, September 11th 2014

9.00 am: OPENING with Robert Rottonara (Mayor of Corvara) and Oscar Alfreider (President of the Tourism Association Alta Badia)

9.30 – 10.00 am: Giuseppe Santi: Cave Bears in Italy: Updates and New Perspectives

10.00 – 10.30 am: Mario Rossi: The Evolution of Cave Bears: Old Hypotheses and New Perspectives

10.30 – 10.45 am: Coffee break

10.45 – 11.15 am: Michael Hofreiter: 20 Years of Cave Bear DNA Sequences at the 20th Cave Bear Symposium

11.15 – 11.45 am: Axel Barlow: Cave Bear Genomics

11.45 – 12.15 pm: Gloria Gonzalez-Fortes: Studying the Cave Bear Populations in North of Spain from Complete Mitochondrial Genomes

12.15 – 2.00 pm: Lunch at Hotel Marmolada

2.00 – 2.30 pm: Martin Sabol: A high-alpine Record of Cave Bears from Slovakia

2.30 – 3.00 pm: Adrian Marciszak: Brown Bear Ursus arctos Linnaeus, 1758 in Poland

3.00 – 3.30 pm: Erik Ersmark: Rise and Fall of the Scandinavian Brown Bear

3.30 – 3.45 pm: Coffee break

3.45 – 4.15 pm: Ana Garcia-Vázquez: Love or Hate? On Brown- and Cave Bears in the Iberian Peninsula

4.15 – 4.45 pm: Doris Nagel: Populations Variations in extant and fossil Spotted Hyenas (Crocuta crocuta)

4.45 – 5.15 pm: Lana Laughlan: The fossil "Gauerblick”-Cave-Fauna

5.15 – 5.45 pm: Ina Wunn: Neanderthal Man, Territoriality and Religion

7.00 pm: Dinner at Hotel Marmolada
Friday, September 12th 2014

EXCURSIONS TO CONTURINES CAVE

GROUP 1 (Hiking Tour)
8.00 am: Departure from Hotel Marmolada: Conturines Cave: 3 hours hiking tour to the cave entrance.

GROUP 2 (Helicopter)
10.00 am: Departure from Hotel Marmolada

ALTERNATIVE PROGRAM

9.00 am: Departure from Hotel Marmolada to Bozen
11.00 – 2.30 pm: South Tyrol Museum of Archeology/Bozen (5000 years old human mummy "Ötzi: http://www.iceman.it/en) and opportunity for a sightseeing tour with lunch break in Bolzano.
2.30 pm: Departure to St. Martin in Thurn
3:00 – 4:30 pm: Visit of the Museum Ladin Ćiastel de Tor http://www.museumladin.it/en/the-museum.asp
4:30 pm: Departure to Corvara
6:30 pm: Dinner at Hotel Marmolada

At 8.30 pm you can join a public talk of Gernot Rabeder at San Cassiano: "Der ladinische Bär und die Conturineshöhle" (in German).

Saturday, September 13th 2014

9.00 – 10.30 am: Poster session in the "Museum Ladin Ursus ladinicus"
10.30 – 12.00 am: Visit of the "Museum Ladin Ursus ladinicus" in St. Kassian
12.00 – 2.00 pm: Opportunity for a lunch break in St. Kassian
2.00 pm: Hiking tour at Prolongia: Dr. Prinoth from "Museum Ladin Ursus ladinicus" will give us an introduction to the geology and history of this region.
6:00 pm: Evening event at the Hotel Panorama, http://www.sporthotel-panorama.com/en/hotel-alta-badia/1-0.html in La Villa
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PREFACE

Dear Colleagues, our 20th International cave bear meeting will be held in very a special place this year. Corvara is located near the over 3,000 meters high Conturines mountains in the Dolomite Alps of Gader valley. The Conturines cave at an altitude of 2,800 m is not only the highest situated bear cave in the world but also the highest site of cave lions. Today the surrounding of the cave is dominated only by rocks, ice and snow – not the environment the herbivorous cave bear would survive. Its fossils are therefore important witnesses for the climate about 50,000 years ago.

But with the bears of Conturines also a cave bear taxon was discovered that is not only morphologically but also genetically different from most alpine cave bears and is known as *Ursus ladinicus* or *Ursus spelaeus ladinicus*. The small museum in San Cassiano called “Museum Ladin Ursus ladinicus”, was established in 2011 and is dedicated exclusively to Conturines and its fossils – so Corvara is a well worthy place for a symposium that concentrates on the fossil faunas of caves.

Vienna, August 2014

Gernot Rabeder & Nadja Kavcik
Cave Bears in Italy: Updates and New Perspectives

Giuseppe Santi 1

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Cave bears in Northern Italy have been known since long ago; however only recently have studies had as topics, the “universe” of these vertebrates. A lot of caves distributed in Northern Italy, from the Liguria to Friuli-Venezia Giulia, have been studied and from them an abundant amount of fossils has been gathered and collected. In the last decade more detailed analyses have been undertaken in particular in the identification of different species of *Ursus* (*deningeri*, *spelaeus* and subordinately, *arcotos*) and in particular in the evolutionary step of “Italian” cave bears. More specifically a sharper morphological and morphometrical analyses, which included both the morphodynamic and the Plumpness Index have been achieved. At present the radiometric data or the mtDNA also are lacking, with the only exception of fossils from the Conturines. Notwithstanding these limitations, some considerations can be taken: 1) *Ursus deningeri* is rarest in the caves of N. Italy (surely identified in the Cerè cave, Verona province) and its presence is only suspected in other places (e.g. in the caves of the Bergamo province), 2) different areas are only superficially or not at all studied (e.g. the caves around Bergamo – Lombardy, or in the Piedmont region), 3) the size of the “Italian” cave bears are globally medium and more rarely large, the morphodynamic index is rather low, the Plumpness index is similar to that of the other European populations. The evolutionary step is globally intermediate. In order to insert the Italian populations inside the global evolutionary schema with the integration of the knowledge of these scarcely known populations, a multidisciplinary project with the collaboration of a number of researchers, called “Ursus project” (morphological-morphometric analyses, aDNA reconstruction, radiometric dating and so on) is in progress, hoping that this new data can bring new and deeper knowledge.
The Evolution of Cave Bears: Old Hypotheses and New Perspectives

Mario Rossi 1 & Giuseppe Santi 2

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The recent introduction of genetic analyses in the study of the cave bears evolution represented a division between two different phyletical approaches: the anagenetic and cladogenetic models.

To the first model is attributable the classic linear model, in which the three chromospecies *U. savini*, *U. deningeri* and *U. spelaeus* gradually and totally transforms each into the other. To the second one is attributable the branched model, characterized by the separation into different phyletic lines which allows to individuate seven diverse taxa, among the species and subspecies.

In our opinion the branched model is preferable because the cladogenetic model better describes the appearance of new species. However this model also shows some problems: 1) the single genetic datum does not allow to discern if two populations belong to different species because the reproductive isolation is not directly observable nor necessarily follows from the genetic difference. 2) It is still a matter of discussion whether the morphological and morphometrical differences support the hypothesis of a specific division, as is considered by some authors.

These considerations together with the data referring to the different Italian populations, suggest the possibility of a third model, informally called “monospecific regional”. This model is based on: 1) the existence of an only species characterized by a certain polypicticy, 2) a global tendency of a species to increase both its size and denture complication, 3) the presence of well characterized evolutionary tendencies concerning populations with clear geographical distribution.

20 Years of Cave Bear DNA Sequences at the 20th International Cave Bear Symposium

Michael Hofreiter 1

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The first DNA sequences of the extinct cave bear were published 20 years ago, representing the first Pleistocene DNA sequences obtained from non-permafrost samples. Since then, the analysis of cave bear sequences has yielded a wide range of new insights into the evolution of this species. At the moment, partial mitochondrial DNA sequences are available for more than 140 specimens, largely complete mitogenomes have been obtained for more than 30 specimens, including a middle Pleistocene specimen from Spain, and the first genome sequencing efforts are also underway. These data have revealed an enormous amount of genetic diversity within cave bears as well as the insight that there was probably more than one late Pleistocene cave bear species. I will review the insights gained by cave bear DNA sequences so far and highlight the many gaps in genetic data that still exist as well as discuss, which further insights can potentially be gained by additional sequencing of both mitochondrial and nuclear DNA from more specimens.
**Cave Bear Genomics**

Axel Barlow 1, Gernot Rabeder, Beth Shapiro, James Cahill, Love Dalén & Michael Hofreiter 2

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The ability to generate genome-level DNA sequence data has revolutionised the study of biology and evolution. However, generating genome-level data from subfossil bones remains challenging as ancient DNA is typically damaged, highly fragmented and present in only trace amounts. In spite of these challenges, the number of published palaeogenomes is steadily increasing, but almost entirely restricted to ancient hominins. We present the first draft genome sequence of an extinct cave bear, *Ursus ingressus*, from Gamssulzen cave, Austria. Critical to this achievement was the realisation that the petrous portion of the temporal bone – the densest bone in the mammalian skeleton – provides exceptional levels of DNA preservation. We find that sequencing libraries generated from cave bear petrous bones can provide as much as 75% endogenous DNA content, greatly increasing the feasibility of palaeogome sequencing. Our draft cave bear genome will provide exciting new insights into cave bear geneflow, demographics, and functional evolution. Sequencing additional cave bear genomes will extend the possibilities even further.

**Studying the Cave Bear Populations in North of Spain from Complete Mitochondrial Genomes**

Gloria González-Fortes 1, Axel Barlow 1, Aurora Grandal-d’Anglade 2, M. Pérez-Ramallo 3, Juan R. Vidal-Romani 2, Trinidad de Torres Pérez-Hidalgo 3, J. E. Ortiz Menéndez 2 & Michael Hofreiter 1

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The development of Next Generation Sequencing (NGS) techniques has opened great possibilities for the genetic study of ancient animals and extinct species. In the last years, the first complete nuclear genomes from extinct species and an increasing number of population genetic time series have been published. However, the endogenous DNA content of most ancient samples is very low, and so the cost of such genetic studies can become prohibitive. We present mitochondrial genomes from 26 cave bear specimens from Spain obtained using a multiplexing approach that involves DNA hybridization capture coupled to next generation sequencing. The feasibility of simultaneous analyse multiple samples, both during the capture and sequencing steps, considerably reduces the costs, while allowing us to recover more than 90% of the mitochondrial genome sequence for each of the specimens. The analyses of these genomes have shed light on the structure and population dynamics of the cave bear lineages that inhabited the North of Spain from before 40,000 years until their extinction. This geographical area is of special interest, as it extends from Navarra in North East Spain to Sierra do Courel, in Galicia, which was one of the last known refuge of the species in Southern Europe. The genetic analysis reveals an interesting microgeographical structure for the cave bears in this area, as well as a genetic diversity that is higher than what has been published before for this species in the South of Europe.
A High-Alpine Record of Cave Bears from Slovakia

Martin Sabol 1 & Branislav Šmída 2

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To date, fossil remains of cave bears were found in at least 60 Slovak caves, although this number could be higher than 100 sites. A high-alpine fossil record, however, is so far known only in two caves (Javorinka Cave and Mesačný tieň Cave), both situated in the Vysoké Tatry Mts.

Javorinka Cave is situated in the western part of the Kolový Úplaz Massif (1,783 m) on a western slope of the central Javorová Valley on the northern side of the Vysoké Tatry Mts., close to 1,254 m elevation. The entrance of this corrosive-erosional cave is located at an altitude of 1,218 m. The cave is a part of the Javorinka-Nádejná cave system with a current length of 10,501 m. Cave bear fossils (preliminarily attributed to Ursus ex gr. spelaeus) were found in two cave parts: “Medvedí dóm” (Bear Dome) in 2011 and the “Medvedia chodba” (Bear Corridor) in 2012 directly on the surface of the cave base. Whereas the “Medvedí dóm” represents a relatively large, 30 m high cave space at an altitude of 1,525 m, the “Medvedia chodba” is a 150 m long horizontal corridor at an altitude of 1,559 m, with height 7 – 8 m and width up to 5 m, oriented parallel to the Kolová Valley. Dating of cave bear samples (metapodials and phalanges, VERA Laboratory in Vienna) is close to the limit of 14C-dating (51,000 + 4,500/-2,900). The date indicates inhabitation of the site by cave bears at least in the Middle Weichselian before 50,000 14C BP, representing a high-alpine cave bear palaeopopulation from early MIS 3. Apart from cave bear remains, fossils of Gulo gulo and Martes martes have also been found in the “Medvedí dóm”.

Mesačný tieň Cave is 32 km long and 451 m deep fluvial-karst cave with active underground streams situated in the Spišmichalova Valley of the Javorínska Široká Massif on the northern side of the Vysoké Tatry Mts. within the Tatranská Javorina local area, Poprad district. Its entrance is located at an altitude of 1,767 m. Cave bear fossils were found during the cave exploration in 2012 and 2013 at the “site 1” (originally “site 2”; altitude 1,577 m a.s.l.) and “site 2” (originally sites 1 and 4; altitude 1,587 m a.s.l.). The analysis of samples, preliminary also attributed to Ursus ex gr. spelaeus, is now in process. Ursid fossils from the “site 1” (a part of Bielovodka Calling cave section) were transported here probably by a seasonal underground waters and deposited in loam-sandy sediments, whereas those from the “site 2” (Bear Corridor) are dispersed on the surface of the gravel-loamy allochthonous alluvial deposits. At the “site 3” (altitude 1,587 m a.s.l.), probably Holocene remains of Ursus arctos were discovered. Also, many skeletons of Martes sp. are spaced almost over the whole cave.

Acknowledgements – The research was carried out with financial support from the Slovak Research and Development Agency under contact APVV-0280-07 and the Slovak Grant Agency under contract Vega 1/0396/12.
Brown bear *Ursus arctos Linnaeus*, 1758 in Poland

Adrian Marciszak 1, Wiktoria Gornig 1 & Zbigniew Jakubiec 2

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The brown bear was permanent, but not very numerous member of Late Pleistocene faunal assemblage in Poland. Even if co-occurred, it is strongly outnumbered by remains of cave bears *Ursus* ex. gr. *spelaeus/ingressus*. Detailed revision of the fossil material showed, that remains of this species are known from more than 50 paleontological and more than 70 archeological localities. The oldest came from mid Middle-Pleistocene and the brown bear is present in the fossil material till the present times. Pleistocene brown bears, especially those from late Middle-Pleistocene and cold periods of the last glacial are characterized by considerable size and robust build. Estimated body mass of some huge specimens fairly exceed dimensions even the largest recent coastal bears from Kodiak Island and Kamchatka Peninsula. Holocene individuals are much smaller, comparable in size with modern Polish brown bears. The highest differences can be found in late glacial and postglacial periods, where large individuals where found in the same site with quite small animals.

Based on detail revision of large amount of material, it can be cautiously said that taxonomical position of large European Late Pleistocene brown bear *Ursus arctos priscus* Goldfuss, 1818 also seems unclear and can be questioned. Apart larger size, we cannot find any significant morphological or metrical features allowing to distinguishing *U. a. priscus* as a separate subspecies or form. Brown bear as a species is characterized by extremely pronounced sexual dimorphism and individual variability, with totally shaded sexual dimorphism and individual variability, with totally shaded

Recently brown bear occurred in Poland only in Carpathian Mts. and neighborhood areas, but some migration events into lowland areas are also known. In historical times *Ursus arctos* dissapeared in main part of the lowland Poland in XVII and XVIII century, while single specimens (most probably migrated) survived till the half of XIX century. The last refugium was the Bialowieza Forest, where it survived until the end of XIX century. Recently the Polish population of the brown bear is regarded as pushed westernmost part of the Carpathian metapopulation of this species. The population is estimated on ca. 110 – 120 specimens.

Rise and Fall of the Scandinavian Brown Bear

George Xenikoudakis 1, 2, Erik Ersmark 1, 2, Lisette Waits 1, Jonas Kindberg 4 & Love Dalén 1

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After the ice retreated from Scandinavia, one of the first large mammals to appear in the early Holocene was the brown bear (*Ursus arctos*). Bears entered the peninsula both from the south and from the north-east, representing two distinct mitochondrial lineages (“western” and “eastern”). During the late 19th century the Scandinavian brown bear went through a major decline in population size, due to intense hunting. It was protected in the 1920’s on the brink of extinction, and the population has subsequently recovered. The genetic diversity in the contemporary population has been investigated in considerable detail, and it has been shown that the population is divided into several subpopulations that display relatively high levels of genetic variation. However, previous studies have been unable to resolve to what extent the demographic bottleneck affected the genetic structure and diversity. We used both mitochondrial and microsatellite DNA markers from pre- and post-bottleneck brown bear to investigate the effect of the decline. Simulation and multivariate analysis suggest the same genetic structure for the historical and modern samples, which are clustered into three subpopulations in southern, central and northern Scandinavia. However, the southern subpopulation appears to have gone through a marked change in allele frequencies as well as suffered a severe loss of mitochondrial haplotypes across the bottleneck. These results indicate a recent decline in genetic diversity and that the current genetic structure seems to pre-date human persecution, possibly reflecting the process of how the bears colonized Scandinavia. The new mitochondrial haplotypes discovered in the historic samples are also adding to the understanding of post-glacial re-colonization of northern Europe by brown bears.
Love or Hate? On the Relation Between Cave- and Brown Bears in the Iberian Peninsula

Ana García-Vázquez 1, Ana C. Pinto Llona 2, Gloria M. González-Forbes 1 & Aurora Grandal-d’Anglade 1

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In this paper we review the chronological and spatial distribution of Pleistocene deposits containing remains of cave and brown bear in the Iberian Peninsula as well as the Holocene deposits with traces of brown bear. The data comes from our own research and from paleontological and archaeological literature.

The brown bear is mentioned in 143 sites, most of which contain a low number of individuals, except two potholes that acted as a natural trap. Considering the few radiometric dates and ages inferred from lithic tecnocomplexes, the 56% of the findings with chronology correspond to the Pleistocene, and the rest are Holocene in age. The cave bear is mentioned in 96 sites, of which 17 are typical sites with large numbers of individuals. The rest yielded very scarce remains, and some need to be reassessed. All are attributed to the Pleistocene, although many of them do not have numerical dating and age is inferred by the intercalation with anthropic levels with lithic tecnocomplexes. The spatial distribution shows that the brown bear occupied all the Iberian Peninsula, although the findings are limited to areas with limestone outcrops. By contrast, the cave bear is restricted to the north of the peninsula, less frequent in Central Iberia, and absent in the karst deposits of the Mediterranean arch, the Atlantic edge and the South of the Peninsula. At Late Middle Pleistocene, deposits of brown bear are in the South Peninsula. During the Upper Pleistocene brown bear is also in the North, sharing habitat with the cave bear. Both species are listed in 22 of the 217 sites included in this study, although not necessarily in the same layers, that is, not precisely at the same dates. This could suggest habitat separation, tending to avoid competition for food resources and winter shelters. In the Holocene, after the extinction of the cave bear, brown bear continues to dwell throughout the peninsula, even in non-karst areas, as mentioned in historical documents. However, the species goes into decline due to human pressure. Since the generalization of firearms, the brown bear quickly disappears from south to north up to the present time, when three small populations survive in the Cantabrian Mountains (West and East) and Pyrenees.

We can conclude that the location of sites with ursids depends heavily on the existence of a limestone substrate with karst development that preserves the bones, but the distribution of both species was probably more extensive. While the cave bear did not reach the southern half despite the availability of karstic areas, brown bear, thanks to its greater ecological plasticity, could occupy the entire peninsula.
Populations Variations in Extant and Fossil Spotted Hyenas (Crocuta crocuta)

Doris Nagel 1, Andrea Engelbrecht 1 and Martin Dockner 1

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The fossil cave hyena from Europe is known to be larger and more robust than its closest relative the extant spotted hyena from Africa. Morphological differences have been discussed on a species as well as subspecies level, without consent among the various authors. Genetic investigations from Rohland et al. (2005) indicate no differentiation on a species level but argued for a complex phylogeography with multiple immigrations to Europe and Asia, which led to different fossil populations. Although the fossil hyena has been found in numerous sites through Europe, only few caves yielded enough specimens to undertake a thorough morphological investigation answering the question whether these populations show anatomical differences as well.

The Teufelslucke in Austria is one of these few sites and comparison with genetically tested material from other localities revealed small differences, which have been interpreted as intro-species morphological variations so far. New investigations focused on the sinus and brain size development as well as on the classical differences in tooth morphology. Brain size seems to be positively correlated with skull size. The variation in sinus volumes compared to brain size and skull size, respectively is more complex and some samples show more than 20% divergence from average.

The main difference in the tooth morphology is the stronger lower fourth premolar. This well-known feature in bone cracking animals concludes with genetic results. Fossil members similar to the Southern extant hyena population (clade C according to Rohland et al., 2005) display slightly different p4 proportions than the ones similar to the Northern population (clade B), very well represented in the Teufelslucken cave. New investigations by Dodge et al. (2012) place the hyena material from the specimens from the Creswell Crags near York (England) into clade B as well. Sheng et al. (2014) now presented a back to Africa theory for Crocuta crocuta, proposing a Eurasian differentiation around 90 kyr into the two mentioned clades.


The Fossil Gauerblick Cave Fauna – First Scientific Results of the High-Alpine Fauna from the Gauerblick Cave in the Rätikon Mountains (Vorarlberg, Austria)

Lana Laughlan 1, Martina Pacher 2 & Gernot Rabeder 1

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The fossils that were discovered in 2007 lied on the bottom of a deep shaft and in summer 2013 a spectacular salvage campaign of these cave bear remains took place. This campaign and its preliminary results have been presented already during the same year at the 19th ICBS in Semriach (Laughlan & Rabeder, 2013). Further results of the examination and laboratory results are now available and will be presented. The found species and salvaged material:

Ursus speleaus cf. ludinicus Rabeder et al. 2004: 453 bone and tooth elements, MNI (minimal individual number) = 15, the percentage of juvenile elements is around 50%.

Canis lupus L.: 9 bones and bone fragments, MNI = 1

Vulpes vulpes (L.): 1 maxillary fragment and one scapula fragment, MNI = 1

Martes foina (ERXLEBEN 1777): 1 Radius, MNI = 1

Rupicapra rupicapra (L.): 7th vertebra cervicalis, MNI = 1

Taxonomic position of cave bear remains – Based on the smaller size of the teeth and extremities the attribution to Ursus speleaus crenus or Ursus (speleaus) ludinicus can be assumed and the Ursus ingressus can be excluded. The amount of suitable teeth for the morphodynamic analysis is not enough for a reliable determination. The relatively high value of m2-Enthypoconid-Index (212.50), but only from four exemplars give a hint that also the bears of the Gauerblick could belong to the “ladinic bear”. A combination of primitive and progressive traits on one maxilla fragment (GB25417/39): with P3-al.

Chronology – Only two from four bone samples that were in the VERA-Laboratory, had enough collage for Dating with the AMS-Method, and one of the cave bear sample from the year 2007 gave an age result of >55,000 BP and the remains of the wolf found during the summer 2013 gave with the ultrafiltration kDa fraction method an age result of >52,600 BP. Thereby a conformance in the geological age with the bears of the Apollo cave exists (Rabeder, 1994, 1995, 1997, 2004).
Neanderthal Man, Territoriality and Religion

Ina Wunn *, Patrick Urban & Constantin Klein
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On the religion or religiosity of Neanderthal men, numerous speculations appeared in literature – some of them well argued, some of them poorly argued. It was in the very first phase of Neanderthal research, that first speculations on this subject popped up, later on, they reappeared in the course of more spectacular findings (e.g. Moula Guercy), and lately also during theological research dealing with the origins of religion itself.

Obvious traces of manipulations on bone material of Neanderthal men, even in connection with real burials, attracted the attention of a wider public. In contrary to the common interpretation of these diagnostic findings as traces of anthropophagy or even as traces of secondary burials, we propose another interpretation: these bone-modifications and depositions of skulls are primarily an indicator for territorial behavior, which seems to be the root of religion.

Bite marks – Numerous cave bear bones have clear bite marks that were most probably caused by a wolf (Laughlan & Rabeder, 2013).

Excavation in Salf di Ces.

Transport of the generator.

POSTERS

Finding situation (Salf di Ces).
Photo: RBERER et al. (2006)
The entrance of the Leopoldinengrotte is situated around 100 m above the valley floor in the Karlstein’s (762 m altitude) southwestern slope, which is close to Semriach. This cave is recognized as one of the most important archaeological cave sites in the Grazer mountain region.

The systematic position of the cave bear remains was already determined during the excavation although only four P4 could be recovered. The evolutionary level of all four exemplars (three upper and one lower P4) is extremely high, like it only occurs in Ursus ingressus faunas (Rabeder et al. 2004). Also the meanwhile determined dimensions of the other teeth and of the metapodials are within the range of Ursus ingressus values.

During the excavation in the Leopoldinengrotte in September 2013 two different layers with fossils and artifacts could be identified. In the front part of the cave there are loams and different clays – intermingled with stones and humus – but these layers are interrupted respectively disturbed by several illegal excavations. The archaeological inventory that was collected in the cave periodically since 1892 and is ranging chronologically from the Palaeolithic to the Neolithic, to the Bronze and Roman age and the Middle ages up to present. Cave bear remains found in upper layers show transportation of fossils from the deeper cave bear layers. In a retral section of the cave (called “bear corridor”) layers were encountered that predominantly contain fossil remains of bears and lions. Again these fossils are not embedded in undisturbed layers, but seem to be submerged and relocated by water together with considerably younger finds like Neolithic pottery and domestic animals.
Cave Bears and Small Mammals Indicate Climate Changes at Merkenstein-Cave, Lower Austria – Revision of the Middle Wurmian Cave Bear Fauna of Merkenstein-Cave

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Merkenstein-cave lies in the eastern foothills of the Northern Calcareous Alps in Lower Austria at 441 m above sea-level. Its two metres wide entrance opens into one large cavity of 72 m length. Fossil contents have been known since 1921 and consist of two clearly distinct layers (MÜHLHOFER & WETTSTEIN 1938). Layer d is dominated by remains of cave bear accompanied by few remains of additional large mammals, e.g. Canis lupus, Crocuta spelaea and Panthera spelaea.

The lens-shaped accumulation d2 contains typical remains of owl pellets and prey of arctic foxes besides additional remains of large mammals like Panthera pardus and Lynx lynx, both probably redeposited from layer d, and Rangifer tarandus. Evidence of Dicrostonyx torquatus, Ochotona pusilla and Lagopus mutus within the so-called “Nagetierschicht” indicate a partly cold and steppe-like environment. The small mammal remains from Merkenstein indicate a Late Glacial age, while the cave bear layer d represents Isotope Stage 3 (Middle Wurmian).

The cave bear assemblage contains some complete long bones and skulls but mainly smaller skeletal elements and teeth (HÜTTER 1955). Certain specimens, like one femur, are among the largest within the cave bear group. Hence, large sized bones and evolved morphotypes of premolars and molars suggest probably remains of Ursus ingressus.

First Palaeontological Analyses of Bächler’s Cave Bear Sites – Drachenloch, Wildkirchli and Wildenmannlisloch in the Eastern Swiss Alps

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The rich cave bear material from three high Alpine sites in Switzerland is housed in the Natural History Museum in Sankt Gallen. The material from the Drachenloch near Vättis (2,475m), the Wildenmannlisloch, Selun (1,620m) and the Wildkirchli, Säntis (1,420m) comes from excavations by Emil Bächler in the years 1905 to 1927 (Bächler 1940), followed by an excavation from E. SCHMID (1977) in Wildkirchli-cave. Based on a co-operation between the Austrian Academy of Science, the Institute of Palaeontology in Vienna and the Natural History Museum in Sankt Gallen the material, which was partly still stored in its original boxes, was consolidated and investigated in order to compare metrical and morphological characteristics of the three cave bear sites. First morphological results suggest remains of Ursus spelaeus eremus in Wildkirchli and only a short-time occurrence of Ursus ingressus. Males and females are nearly equally preserved in the assemblage (the sex ratio fluctuates in the profile, see poster by SESAR & RABEDER, this symposium), while females dominate among the Drachenloch cave bears, which again are ascribed to U. sp. eremus. The rather small, female dominated material from Wildenmannlisloch allows no clear determination within the cave bear group, so far. Unfortunately aDNA analyses in the three caves failed. The old chronological age – radiocarbon analyses gave “older than” ages around 50,000 BP – and about hundred years of storage account for the poor preservation of organic material. Nonetheless isotope analyses were successful. The obtained results for the three Swiss cave bear sites confirmed the already observed trend to more depleted carbon isotope (δ13C) with increasing height of the cave (PACHER et al. 2012).


SESR, M. & RABEDER, G., 2014. Evolutionary Palaeobiological Studies on Cave Bear Teeth and Bones from the Alpine Cave Wildkirchli (Santis, Schweiz). — Poster, this symposium.
 Genetic Variability and Population History of Eurasian Wolverines since the Late Pleistocene

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Although wolverines (Gulo gulo) are found in the Late Pleistocene records from large parts of Europe, the current distribution of Eurasian wolverines is limited to the Scandinavian peninsula and circumpolar regions of Asia. The modern population in Scandinavia displays low levels of genetic variability, suggesting that this population has been isolated for an extended period of time (Walker et al. 2001). However, the origins of this population, as well as general population dynamics of wolverines over the past 20,000 years are largely unknown. By analysing mitochondrial DNA from historic and ancient wolverine samples, we assess the population history of Eurasian wolverines since the Late Pleistocene.

Preliminary studies on ancient DNA have suggested that the modern Scandinavian wolverines are not descendants of Pleistocene European wolverines (Stillier et al. 2008). Here we present mitochondrial genomes from historical Eurasian samples, which show three distinct mitochondrial lineages separating Scandinavian, Ural and Siberian populations. The relatively deep divergence between the three clades suggests that the phylogeographic structure of Eurasian wolverines represents the result of a post-glacial re-colonisation from separate refugia during the Early Holocene rather than a more recent event.

To further investigate the population history of Eurasian wolverines and the fate of the extinct European population, ongoing investigations focus on retrieving additional data from ancient wolverine samples from Central Europe, as well as the Ural region and Siberia.


“Ursus Project”: A Multidisciplinary Study of the Northern Italian Cave Bear

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Evolutionary studies of the cave bear (Ursus spelaeus) are possible thanks to a large number of available retrievals due to its wide diffusion in Europe and Asia during Pleistocene. The high morphological variability detected in European samples, suggested that palaeontologists consider the presence of local evolutionary trends. Recently, the morphological and morphometric analyses of cave bear bones and teeth, were complemented by genetic data performed on the mitochondrial genome. As a consequence, new taxa have been proposed. Here we present the “Ursus project”, a multidisciplinary approach to study the cave bear variability of samples recovered from Northern Italian sites. Subject of this work is to morphometrically study the cave bears coming from some selected caves located in several Italian caves. In addition to the morphometric and morphological analyses, all samples will be studied under the ancient DNA (aDNA) perspective. aDNA isolated from Northern Italy samples will be analysed by the combined approach of genomic capture and next generation sequencing (NGS). The genomic capture will be performed using specific oligonucleotides probes, called “molecular baits”, that selectively isolate the endogenous bear aDNA, excluding all possible contaminant sequences and preventing typical problems in aDNA sequencing. A population genetic study will be performed on all possible samples and the complete mitochondrial genome sequence will be recovered for all. The study will then be
focused on the identification of the cave bears haplogroups by a phylogenetic clustering. The cave bear genetic population results will also be compared to the available extant bear sequences in order to establish a hypothetical gene flow. Topics of this project are:

1) to integrate the knowledge of the Italian populations using the genetic data and, if possible, the chronological ones,
2) to individuate eventual schemes of distribution allowing to correlate both genetic and morphological-morphometrical data.

Eifel – The Westernmost Cave Bear Region of Germany

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The Eifel belongs to the Rhine-Massif (Rheinisches Schiefergebirge) and is located in the quadrangle of Trier at the river Mosel, Koblenz and Bonn at the Rhine and Aachen in the north. The highest mountain of this low mountain range is the volcanic cone Hohe Acht (746,9 m / 2,451 ft.).

The Eifel consists mainly of Devonian slate, limestone and sandstone and is one of the few active volcanic areas in Germany. The peculiar circle-shaped lakes (maar) are typical for this volcanic area. The last eruption (Laacher Lake) took place around 11,000 years ago.

Although no glaciation during the Ice Ages was known discoveries are barely survived from this period. The poverty of finds can explain through the regional geological development. From six sites of about 650 explored caves in the Eifel palaeontological and archaeological remains from the Middle Paleolithic and Upper Paleolithic are documented. Finds of cave bears are known from the Große Höhle (cave I, main cave) and Kleine Höhle (cave II, Kaltes Loch) of the Kartstein at Mechernich and the Buchenloch and Magdalenahöhle of the Munterley at Gerolstein.

Cave Bears in Italy: 1 – The Data

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In several caves of North Italy a great amount of cave bear remains has been gathered and collected; during the last decade important discoveries have been achieved. For example, in the Cerè cave (Verona) the presence of Ursus deningeri von Reichenau, 1906 (one of the more rare fossils of this bear in the Italian caves) has been identified. The data are principally referred to the morphology, morphodynamic and in some cases chronological dating. With the actual collected data, some considerations can be undertaken:

1) The radiometric data (very low in number) of the bear fossils are between the 82,000 and 22,000 yr., and using the pollen content the younger strata of the Covoli di Velo (Verona) are more recent than 18,000 yr.,

2) the cave bear populations are globally of medium size and exceptionally of a large size, and of a simple configuration of the P4/4. This can be linked to an intermediate evolutionary step and are confirmed by the metapodial analyses. Moreover the Italian speleians show an evolutionary trend divided by that formed by the foreign populations (in particular Austria, Germany and Greece). This could be a possible proof of the presence of a “Mediterranean macroarea” south of the Alps inhabited by bears having unique morphological-morphometrical features.

3) The presence of the only species Ursus spelaeus Rosenmüller, 1794 and the difficulty to divide U. spelaeus from U. deningeri von Reichenau, 1906 are confirmed and could be enlarged to other populations living in the southern Alps with, maybe, some exceptions to be found in the border caves (Liguria – France, Piedmont – France, Lombardy – Switzerland) where a mixture among different populations is possible. What is the future? A multidisciplinary project (mtDNA extraction, the classic morphometric and morphodynamic analyses, a greater number in radiometric data) is in progress. This, will allow to extend the knowledge on cave bears and to ameliorate the panoramic view on the evolutionary degree of cave bears in Italy.

A New Bear Endocast from Neanderthal Travertine Site of Gánovce (Slovakia)

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During a search for former fossil remains from the Neanderthal travertine site of Gánovce situated out of Slovakia, a new bear endocast was found among fossils of the J. Petrbok’s collection, stored now in the National Museum in Prague, Czech Republic. The rediscovered bear endocast (Nr. 25246), damaged and partly covered by travertine, is worse preserved than the bear endocast (R-604) reported one year ago at the symposium. Only left side of the endocast is – together with its base – relatively well preserved, whereas right side of the specimen is more damaged and the dorsal side is fully covered by rock. The anterior part of the endocast is much more damaged. On the right side, only two textures are distinguished in lower part of the central division – a weakly damaged larger gyrus (probably gyrus suprasylvius) and a sulcus fragment. The left side is morphologically more conspicuous, but damaged on the surface. There are textures distinguished as follows: damaged g. marginalis, distinct g. suprasylvius and g. ectosylvius with obvious fissura sylvii indicating a position of sulcus ectosylvius which separates f. rhinalis posterior from f. rhinalis anterior. G. coronalis and g. cruciatus(?), separated by sulcus coronalis, are probably also present at the endocast. The shape of “Sagittalwülste” at the endocast base indicates its possible attribution to a speleoid bear. More detailed study of this specimen is in process.

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Evolutionary Palaeobiological Studies on Cave Bear Teeth and Bones from the Alpine Cave Wildkirchli (Säntis, Switzerland)

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Wildkirchli is the most renowned bear cave of the Alps. Wildkirchli’s prominence is only partly owed to the abundance of fossil records of bears therein but moreover to the alleged and actual traces of paleolithic humans, which Emil Bächler from St. Gallen excavated in the period between 1904 and 1906. Even prior to the cave becoming scientifically relevant, Victor Scheffel’s novel “Ekkehard” draw substantial attention to Wildkirchli, paving its way to global prominence. Layers of rock and gravel amounting to no less than five meters revealed a wide array of archaeological inventory, which was subject to extensive preparation before permitting scientific analysis (see Pacher et al. 2014, Poster, this symposium).

One aspect of this new line of research is dedicated to the potentially detectable variances of dental metrics and morphology as well as of metapodial bones throughout the course of the profile. The mostly clayey sediments were partly quarried in very gross units with a thickness ranging from 10 centimeters to 1,3 meters. Nevertheless it was attempted to retrace the regime of the dimensions and morphological indexes in the profile to determine trends, which could correlate to climatic fluctuations. Due to the gross stratigraphy in the documented discoveries and based on the amount of surviving elements, only four big units were consolidated in this profile:

Profile unit A = 0 – 100 cm
Profile unit B = 100 – 170 cm
Profile unit C = 170 – 300 cm
Profile unit D = 300 – 400 cm

The following general trends can be deducted from the lower to the upper:

• The percentage of female animals increases with the sex index rising from around 30% in profile unit D to 49% in unit A.

• The sex-dimorphism index increases with regard to the length from 131% to 135%, with regard to the width from 130% to 133%.

• The average values of length and width of teeth decrease from the floor to the top of the profile.

• The plumpness index of the metapodials builds up substantially within the same period of observation: the standardized midpoints rise from 88% to 98% as compared to the standard fauna of the Gamssulzenhöhle.

• In profile unit B highly evolved morphotypes of P4 were discovered, admitting suspicion that Ursus ingressus immigrated and inhabited the cave for a relatively brief period of time.

Still subject to further research and discovery can be detected by remarkable variations of the values within the course of the profile and the contradictions within the different trends: apart from the increase of frequency of occurrence of females, other evolutionary tendencies could have had an impact, i.e. the adaption to life in the Alpine region, changes of the nutritional situation due to climatic changes, as well as the immigration of another bear, Ursus ingressus.

Biochronology of Ursids from Ciemna Cave
(Southern Poland)

Katarzyna Zarzecka-Szubińska, Grzegorz Lipecki, Krzysztof Sobczyk, Paweł Valde-Nowak & Adrian Marciszak

Ciemna Cave (50°11'47" N, 19°49'54" E, 410 m a.s.l.) is a large, collapsed cave system, where excavations started at the end of XIX century. After they were conducted in 1918 – 1919 and in 1963 – 1968 (Wojtal 2007). Recent excavations started in 2007 and are taken until recent. Remains of human occupations from Late Pleistocene (MIS 6-3) were found. Faunal assemblage includes amongst other: Lepus europaeus, Canis lupus, Vulpes lagopus, Ursus spelaeus, Ursus arctos, Panthera spelaea, Lynx lynx, Crocuta crocuta spelaea, Coleodonta antiquitatis, Equus caballus, Capreolus capreolus, Rangifer tarandus, Elephas primigenius, Bison priscus, Rupicapra rupicapra, Capra cf. ibex and the most numerous (Wojtal 2007). Layers (15) are dated on MIS 6-1 (Valde-Nowak 2014).

Remains of cave bear (Ursus spelaeus) from main chamber belonged to very young (even to fetuses) and adult specimens probably died during hibernation. All elements of skeleton are present, but the remains were not in anatomical position. Bones of adult bear represent massive, large forms from the Last Glacial. Some part of cave bear remains, especially metapodial bones and vertebra, shows pathology sings. Among cave bear remains in the 8th layer also appear a few slender bones of brown bear (Ursus arctos), mostly metapodial bones, which are characterized by quite considerable size.


Wojtal, P. 2007. Zooarchaeological studies of the Late Pleistocene sites in Poland. — Institute of Systematics and Evolution of Animals, Polish Academy of Sciences Kraków.

A Probable “Human” Femur in the Cerè Cave
(Verona, Northern Italy)

Roberto Zorzin, Mario Rossi, Matteo Crozi & Giuseppe Santi

Among the fossils from the Cerè cave (Verona, Veneto region) a singular femur, previously identified as U. arctos, was identified. Its fossilization is similar to those of the other bones from this hole, and it is broken in two parts that match only partially. This bone is also lightly mashed, but in general is well preserved. A comparison with a femur of Ursus spelaeus from the Covoli di Velo (the most important cave in the Verona province) has been done; some differences have been noted allowing to reject the previous classification. Overall, the femur shows a very accentuated bicondilar angle that is compatible with a bipedal locomotion; an evident curvature of the diaphysis and other minor differences, in comparison with the U. spelaeus femur in the proximal epiphysis area. Using the “Structure from Motion” or “sfm” technique, a 3D analysis of these femurs from Cerè cave and Covoli di Velo, has been elaborated to better interpret this characteristic bone. The digitization of these bones is a tool that minimizes the damage to the fossils and allows great virtual handling.
Cleaned skull and bones of *Ursus ladinicus* Rabeder et al., 2004 as occurring in Salf di Ces (Hall of Skulls) ready for documentation. Photo: G. Withalm
Excursions to Conturines Cave

GROUP 1 (Hiking Tour)

8.00 am: Departure from Hotel Marmolada: Conturines Cave: 3 hours hiking tour to the cave entrance.

The hiking tour will start from the refuge "Capanna Alpina" (1,726 m a.s.l.) and follow mule track no. 11, on a conveniently steep foot path on the opposite side of Plan de Furcia. Col de Locia (2,069 m a.s.l.), with its nice panoramic view, invites for a little break. The foot path continues more or less horizontally until a somewhat wider plain with marmot dwellings on the western side opens up.

This is the place to leave track no. 11 and to follow a narrow and partly steep path which is sometimes not so easy to find. After crossing a small stream it leads through a usually dry mountain stream, crosses ridges covered with mountain pines and finally leaves the vegetated region, following the steep cirque called "Valun dles Awares", see Fig. 1. At approximately 2,400 m a.s.l. it is time to follow the path directly into the steep wall, which builds up on the left-handed side. Please follow the directions of your tour-guide as it is a tricky passage!

At the end of this passage, the second and last cirque opens up, offering lots of gravel of different sizes. At its very end the entrance of Conturines cave opens up towards East, but a few meters below, there are two big blocks, big enough to serve as a landing place for helicopters. On your way up you will see them coming closer and closer, but it takes of course time. Be patient!

Figure 1: Sketch of the path leading to Conturines Cave. Illustration taken from Rabeder (1991).
Ground View of Conturines Cave
(S-Tyrol, Italy)

Dolomitic sand
Sinter
Guano from jackdaw
Flowstone formations

Conturines Cave & Excavations

There is no other Upper Alpine cave in Alps that is so abundantly decorated with sinter and flowstone figures as is the Conturines cave, e.g. the "Raïeta". The ground of the cave is partly covered with fine-bedded sinter, which has been deposited at about 600,000 years ago, in a period in that no cave bears have yet existed. The scientific excavations began already one year after the cave's discovery. From 1988 till 2001 excavations of a duration between two and three weeks have been carried out on a yearly basis by a team consisting of students and taxidermists from the Institute of Palaeontology (University of Vienna) under the scientific direction of Prof. Dr. Gernot Rabeder. The extreme position of the cave, which is almost 2,800 m high, led to several difficulties. The assignment was only possible with a helicopter, for the excavation crew it brought big exertions.

The material that has been recovered during the excavations, consists of skulls, of numerous bones and single teeth, see Fig. 2. The inventory at the Institute for Palaeontology of the University Vienna shows that. All teeth and bones are inventoried, labeled and measured. The gathered informations are basis for the palaeontological research. Such a large material of teeth and bones from Conturines cave allows also for the use of statistical methods for comparison with other faunas.

Cave bears had probably the same time of birth as the brown bears. The females gave birth during winter apex to one or two cubs that were not heavier as a half kilogram. Dead births are also approved through the record of two new-born skeletons in the Conturines cave. During the excavation large quantities of milk teeth were found. This is an evidence that the cave has been used as a shelter also in summer, because the young bears lose their milk teeth in their second year at late summer. At bad weather or during the night the cave bears used the cave for safety.