

## URSUS SPELAEUS ROSENMÜLLER, 1794 FROM THE VENETIAN REGION OF NORTHERN ITALY: PRELIMINARY NOTES ON ITS EVOLUTIONARY PATH

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With 6 figures and 1 plate

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### Abstract

According to morphometric data, population remains of bears ascribed to the *deningeri-spelaeus* group have been identified in caves of the Venetian region of Northern Italy: Cerè Cave, Covoli di Velo, San Donà di Lamon and Veja. Some initial observations about the evolutionary path of these cave bears are presented.

### Introduction and previous work

Numerous caves distributed over the Alpine and pre-Alpine areas including Cerè Cave, the Covoli di Velo and Veja caves (Province of Verona), and the San Donà di Lamon cave (Province of Belluno) (Fig. 1) are of great importance, both historically and for the abundance of bear fossils. They provide a large number of morphometric data stimulating several interesting considerations on the presence of these fossils in the Venetian region. The studied deposits show that these areas were inhabited either by *Ursus spelaeus* Rosenmüller, 1794, or *Ursus arctos* Linnaeus, 1758 albeit in different proportions; in fact, the cave bear – *Ursus spelaeus* – represents the most abundant species. Until now, the presence of *Ursus deningeri* Von Reichenau, 1906 has only been assumed (Zorzin et al., in press). The most recent studies (i.e Rossi & Santi, 2005) on newly found fossils from the Cerè Cave, the most significant results of which will be presented in this paper, have confirmed the presence of this species. Currently,

radiometric data are available for only a few caves in Northern Italy. The best known is the Grotta Sopra Fontana Marella (Varese Province, Lombardy). For other caves (e.g. the Caverna Generosa, Varese Province) data are still incomplete (Bona, 2004) and are lacking in the Venetian region. Radiometric data and aminoacid

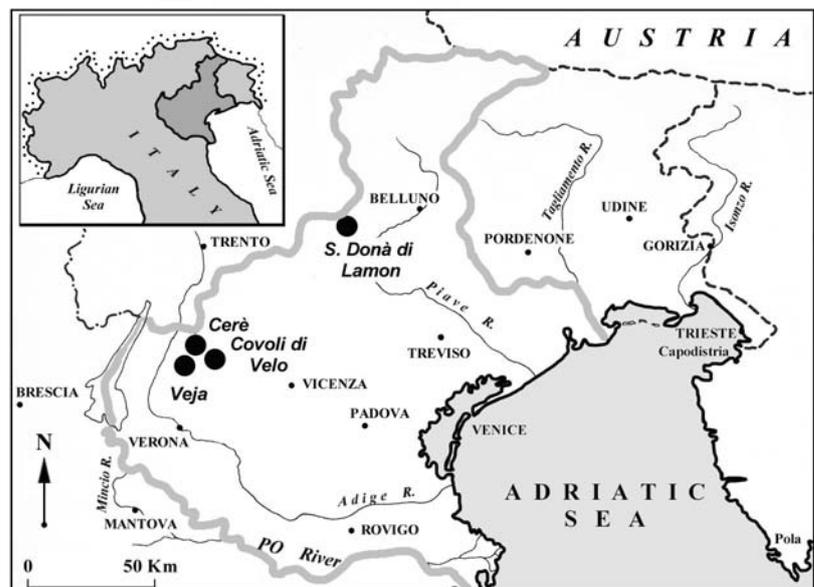


Fig. 1: Geographic position of the main caves of the Venetian region.

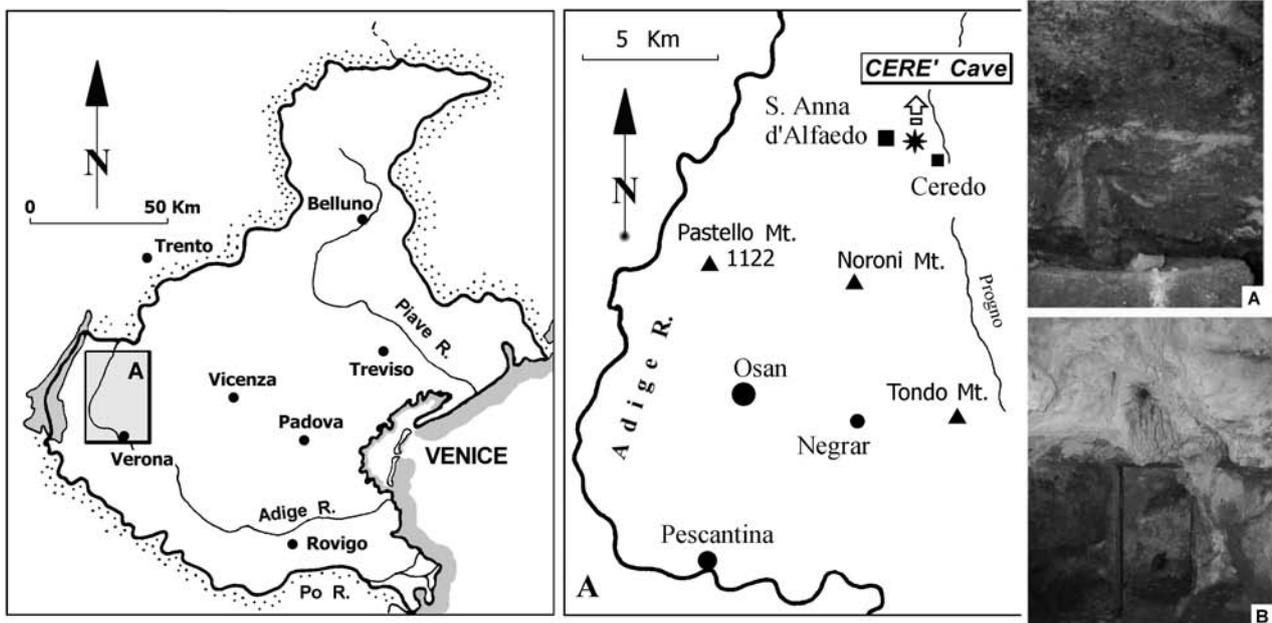


Fig. 2: Geographic position of the Cerè Cave. A – Lateral wall of the cave in bone breccias. B – Entrance of the Cerè Cave.

racemization of the bear bones from Grotta Sopra Fontana Marella provide the following ages: FM4 over 26000 years BP, FM2,  $22310 \pm 200$  and FM1  $21810 \pm 200$  years BP (Perego et al., 2001).

For many years the Venetian caves have constituted an important research target. A review of the inventory of the Pleistocene-Holocene fauna from these caves was compiled by Bon et al. (1991, cum bibli.) based on fossils stored at different localities in Northern Italy. More recently, studies on populations of bears and other fossil groups from the Cerè Cave, Covoli di Velo, San Donà di Lamon and Veja caves have been published by Rossi & Santi (2001 a, b, 2002), Zorzin et. al. (2003, 2004 and in press) and Rossi et al. (2004).

### Brief background on the stratigraphy of the Cerè Cave

The Cerè Cave, known also as the "Tana dell'Orso" or the "Tanasela" (Fig. 2), is located at an altitude of about 750 m a.s.l. and is 12 m deep; it opens at the hydrographically right side of the Vajo dell'Anguilla within the Rosso Ammonitico Formation about 150 m east of Ceredo (S. Anna di Alfaedo) village. The entrance is near a distinct fracture of the slope that characterizes the right side of the Vajo dei Falconi. From bottom to top, the

7.50 m thick stratigraphic succession is composed (Zorzin et al., 2003) as follows:

1. Ferrous-manganesiferous clay containing concretions (at the karstic bed rock contact).
2. Calcareous concretions, locally very thick.
3. Fine-grained, mixed carbonate-siliciclastic sand with small amounts of clay filling the bottom of the depressions and the karst fissures. Locally, a thin layer of yellow or reddish clay is present below concretion 4.
4. Concretion rich in siliceous and patinated detrital material.
5. Plastic clay containing pebbles up to 1 cm in size.
6. Horizon with concretions.
7. Plastic red clay containing rare fossil remains and siliceous detrital fragments with diameters up to 5 cm.
8. Red clay with abundant pebbles of chert and slightly altered gravel.
9. Dark layer rich in bone remains mostly belonging to *Canis lupus* containing concretions and rich in siliceous and rare chert pebbles with diameters of 1 to 3 cm.
10. Dark layer rich in bone remains predominantly belonging to *Ursus*, with calcareous pebbles about 2 cm in size.
11. Strongly cemented bone-breccia, with abundant remains of *Ursus*, *Canis lupus* and *Marmota*.

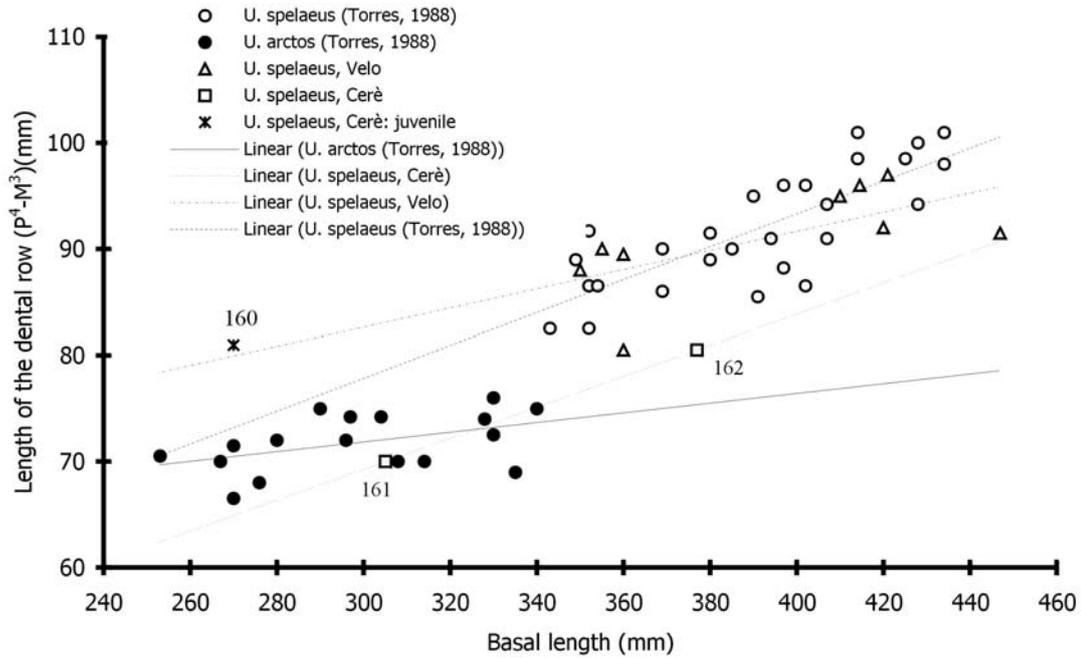


Fig. 3: Ratio between "basal length" and "length of dental row" for bear skulls from Italian and other localities.

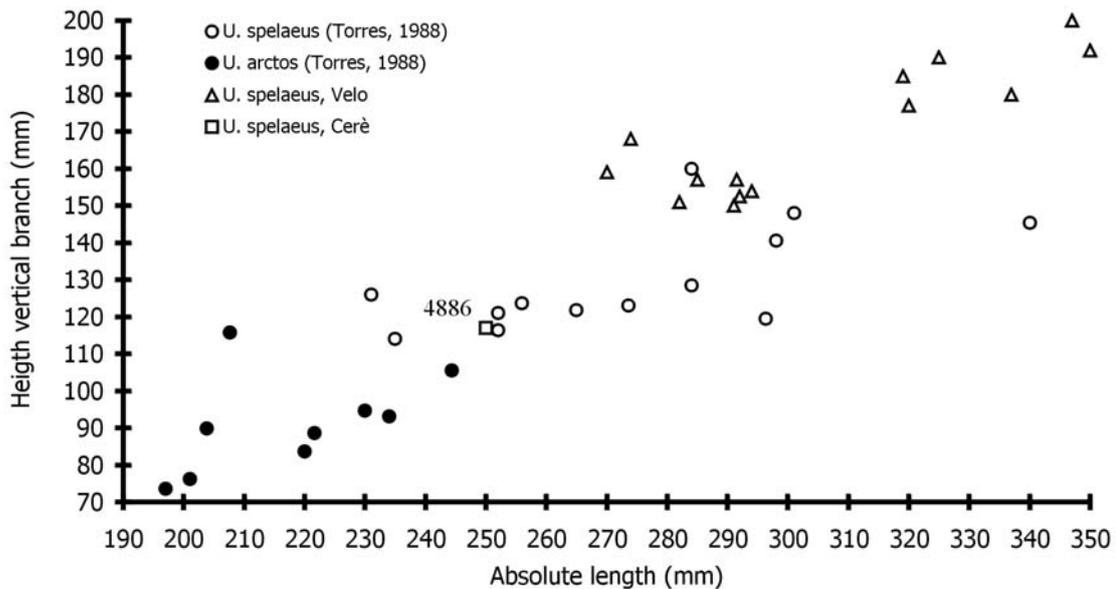


Fig. 4: Ratio between "absolute length" and "height of vertical branch" for bear mandibles from Italian and other localities.

12. Breccia containing small amounts of sediment composed of strongly cemented large blocks.
13. Breccia with chert pebbles from 1 to 3 cm in size.
14. Calcareous breccia with chert pebbles from 1 to 5 cm in size.
15. Breccias with chert pebbles from 1 to 5 cm in size.

### Distribution of *Ursus* species in the Venetian region

Before presenting the main morphometric data, we believe it is useful to indicate the distribution of the *Ursus* species in the following caves: 1) Cerè Cave: *Ursus*

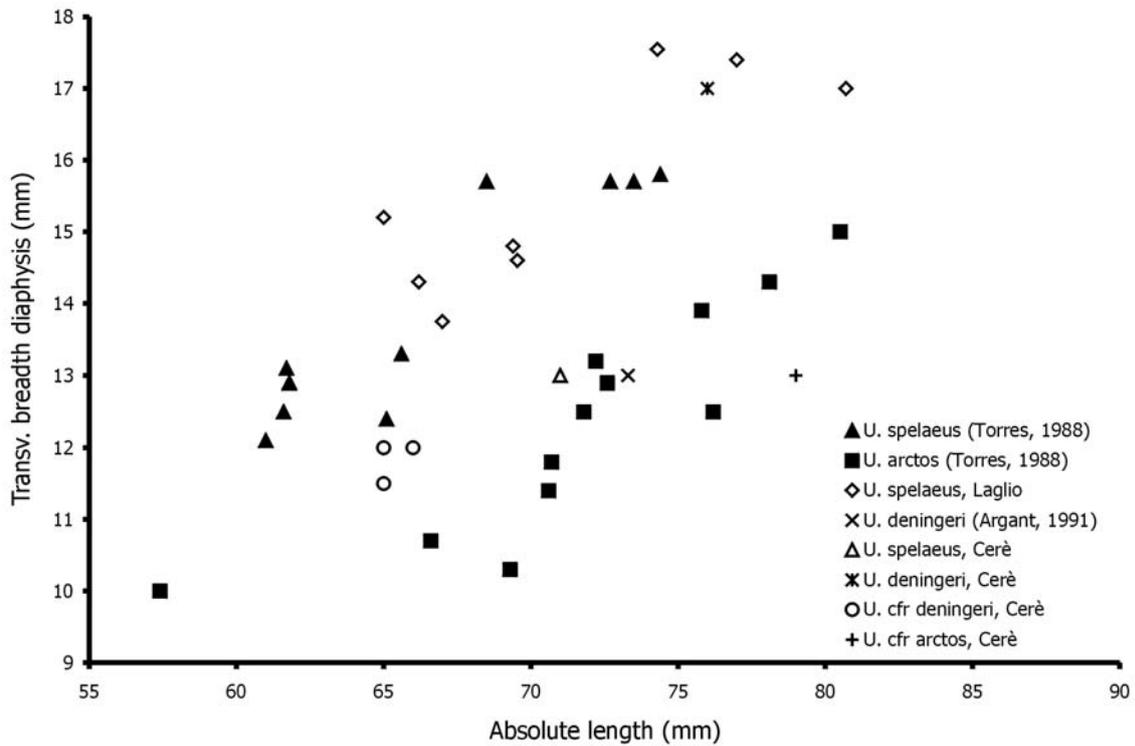


Fig. 5: Ratio between "absolute length" and "transversal width of the diaphysis" for the II metatarsus of bears from the Cerè Cave and other Italian and other caves.

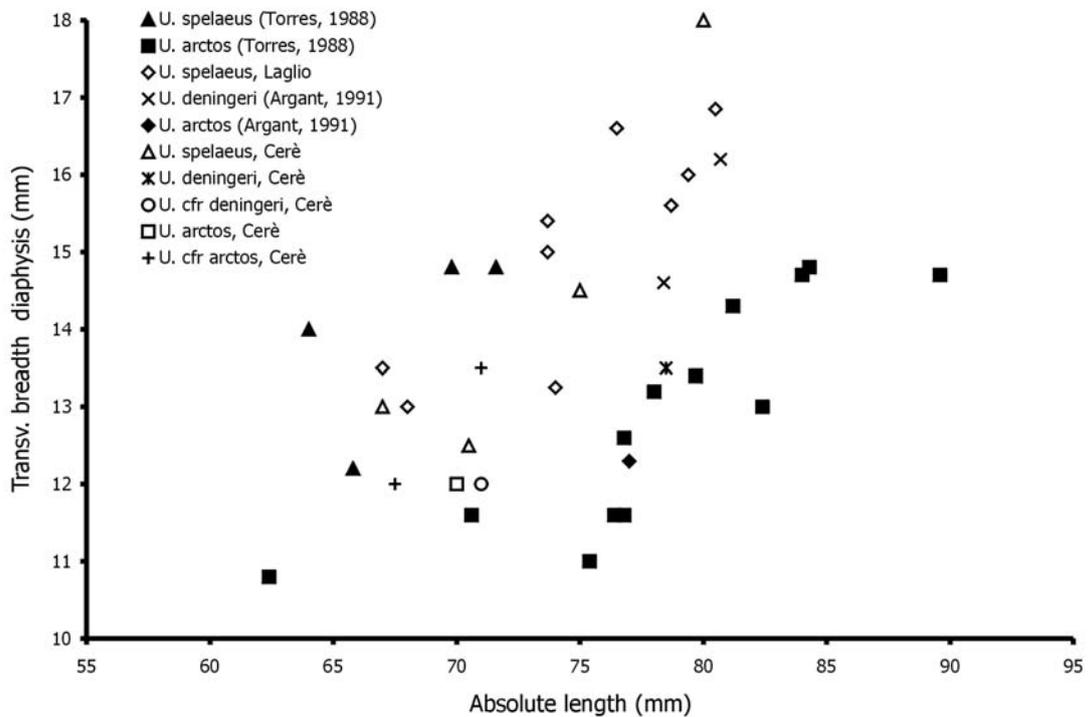


Fig. 6: Ratio between "absolute length" and "transversal width of the diaphysis" for the III metatarsus of bears from the Cerè Cave and other Italian and other caves.

*deningeri*, *U. spelaeus*, *U. arctos*; 2) Covoli di Velo: *Ursus spelaeus*; 3) Veja: *Ursus spelaeus*; 4) San Donà di Lamon: *Ursus spelaeus* (Pl. 1). Considering the rarity of fossils pertaining to *U. deningeri* not only in Northern Italy, but also in the rest of the peninsula, their presence within the Cerè Cave is of great importance.

## Morphometry

Morphometric analysis was carried out on several hundreds of fossils from a large portion of the skeleton (except for the vertebrae, ribs and other anatomic parts whose limited number of specimens prevented an indisputable analysis) stored in the Museo Civico di Storia Naturale of Verona and compared with other fossils from Northern Italy (Grotta del Buco dell'Orso – Laglio, Como Province; Grotta Sopra Fontana Marella – Varese Province; Grotta delle Streghe – Sambughetto Valstrona, Verbania Province) including foreign examples, particularly from Spanish caves (Torres, 1988). The findings have allowed us to advance a number of hypotheses (Figs. 3–6).

- a) **Cerè Cave:** The morphometric data show the presence of populations from the *deningeri-spelaeus* group and the large number of fossils, especially of the metapodial bones, have confirmed the above mentioned observations.
- b) **Covoli di Velo:** Unlike the Cerè Cave, the fossils are exclusively from larger-sized bears while those in medium- to small-size ranges ones appear to be very poorly represented.
- c) **San Donà di Lamon and Veja:** The morphometric analysis of the rather limited remains in these localities confirms the presence of relatively medium- to large-sized populations similar to those that lived in the Covoli di Velo region.

## Hypothesis about the possible *Ursus deningeri* "track of ways"

The presence of the deningerian remains in the Cerè Cave, rarely found in Central Italy and the Alpine and pre-Alpine sectors of the Western and Central Alps, may indicate migration paths that initially followed a N-S-direction, possibly encouraged by the overall mildness of the climate in the more southern regions, and later also in an E-W-direction. The lack of the *Ursus deningeri* remains in other areas may be due to a gap in the fossil record linked to inadequate fossil preservation or unsuccessful discovery of the deposits. However, it may also be

a consequence of a limited expansion of these former groups that were able to colonize only in this limited area in Northern Italy. The remaining zones could have been further colonized starting from a supposed initial point, represented by the Venetian populations originally from Central Europe, which experienced a rapid and articulated evolution.

## Preliminary concluding remarks

Based on the morphometric analysis that shows the bear fossils belong to the *deningeri-spelaeus* group, some preliminary conclusions can be drawn:

- a) The main caves of the Venetian region were inhabited by bears of the *deningeri-spelaeus* group, but in the Cerè Cave the continuous presence of both *Ursus deningeri* and *Ursus spelaeus* (medium- to large-sized) from their intermediate to final evolutionary stages is certain. In other regions only large sized cave bear populations are evident and linked to the final phase of the evolutionary path of this species.
- b) The presence of the three species in the Cerè Cave indicates its prolonged inhabitation in ancient times compared to the other caves. Hence, the *Ursus deningeri* population may represent the original nucleus from which subsequent forms may have developed with their final examples being discovered in the other caves examined. These populations are morphometrically comparable to those from the more recent beds of the Grotta Sopra Fontana Marella dated 21810±200 years BP (Perego et al., 2001).

Some data indicate the presence of *Ursus deningeri* in the Delle Ossa Cave near Zandobbio village (Bergamo Province, Lombardy), but further investigations are required to confirm its occurrence in this area. If future research confirms the exclusiveness of the findings in the Cerè Cave, its importance will increase. In fact, on the basis of this data, this zone could represent an expansion nucleus for the Venetian region as well for the whole of Northern Italy.

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Plate 1: *Ursus spelaeus* Rosenmüller, 1794. A - Skull V160 (Cerè Cave), dorsal view, B - Skull V 162 (Cerè Cave), dorsal view, C - Mandible V 4673 (Cerè Cave), internal lateral view, D - Mandible V 2886 (Veja), external lateral view, E - Mandible V 2887 (Veja), internal lateral view, F - Mandible V 9889 B (Covoli di Velo), external lateral view, G - Skull V 161 (Cerè Cave), lateral view.

