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Mind the Bear:

A calculation of a cave bear bite force and comparison to other large carnivora taxa

One of the features of the Cave Bear skull is an enlarged frontal region that provides the characteristic step profile of the species and in which strong chewing temporal muscles were attached, as was pointed out by KURTÉN (1976).

Accordingly to the disposition of the chewing muscles of the cave bear, the chewing power should had been stronger in the posterior part of the jaw, where the most powerful grinders were situated: the heel of the upper second molar acting against the lower second and third molars.

The advantage of using the postcanassial molars as crushers rather than the premolars (as other Carnivora taxa do) is that the jaw muscles can exert more force closer to the mandibular joint. The disadvantage is that the diameter of the food item that can be processed between the teeth is small, because gape is restricted in comparison with those carnivores that crush bones with the premolars, such as hyenas.

However, the real bite force that the cave bear could exert in a determined point is unknown. Although many studies have been carried out on the skull proportions of carnivores over the years, to elucidate patterns of allometry and functional anatomy, estimations of bite forces were largely lacking.

A significant relationship does exist between body mass and bite force as the true mechanical strength of the canines relative to bite force will depend on the actual force that is put on them by the action of the jaw adductors. However, empirical data on bite force are not easily obtained even for extant species and remained largely unexplored. THOMASON (1991) proposed a simple model to compute bite forces in carnivores, but only in the last years some research was carried out in this field. Published comparative studies on carnivore bite force (CHRISTIANSEN 2005, WROE et al. 2005), however, do not include data on cave bears.

In this contribution we apply the model proposed by THOMASON (1991) to some cave bears skulls and compare the results to other published results concerning bite force of several carnivora taxa. The estimated cave bear bite forces are high but in spite of the large size of the cave bear skull, do not surpass other large predatory carnivores.

Previous morphometric studies showed that the sexual dimorphism is not equally marked in all the regions of the skull, but is manifested by the stronger reinforcement in males of the areas where neck and masticatory muscles are attached (GRANDAL & LÓPEZ 2005). In this study we compare also the obtained values for males and females, in order to know if there are significant differences between sexes.

References

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