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ABSTRACT BOOK

XXI CONVEGNO DELLA SOCIETÀ PALEONTOLOGICA
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BOLOGNA (14)15-17 GIUGNO 2021

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MECHANICAL CHARACTERIZATION OF TIBIAL BONE MATERIAL OF AN OSTRICH

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Ostriches are praised for their feathers and running abilities since ancient times, arousing interest to breed these animals in farms. In recent years many studies have been focused on ostrich biomechanics, driven by the accessibility of these animals and their peculiar adaptation for running abilities and leg musculature. Ostrich bones are hollowed arousing interest in their mechanical properties. The study of bone material has been faced in the past in several studies, but many presented results about the whole bone structure rather than the material itself. Here we present the first results from a broad review of the mechanical properties of ostrich bones, mainly focusing on the tibial bone, with the aim to characterize the material at its best. Two samples were obtained, an adult ostrich tibia of unknown age and a young specimen of 9 - 15 months of age, purchased from a butcher serving the food industry, under veterinary supervision. The bones have been sectioned with a circular saw in order to obtain samples of appropriate dimensions. Tensile strength tests have been performed on samples from the central portion of the diaphysis of tibial bones, while compression tests have been done on the extremities of the diaphyseal shaft. Results from the tests have evidenced that the condition of the bone deeply affects the mechanical tests. The adult tibia was completely dried and kept at unknown conditions for years at the time when received by the authors. It has been preserved at environmental conditions and only part of the samples has been kept overnight immersed in water before testing. The young bones have been preserved in a freezer at -18° up to the moment of processing. The results have evidenced that the old dried bone performs as elastic-fragile material reaching a top yield stress of 80MPa, with a maximum strain of around 0.5%, while wetting it makes it assume a more elastic mechanical behavior, closer to the young bone values, with a maximum yield strength of around 100MPa and a maximum strain value of 1%. The young bone has evidenced the ability to sustain a higher yield stress value, up to 120MPa with a strain value of 1.3%, and a ductile behavior before breaking at up to 140MPa with a strain value of 1.6%. The compression tests have evidenced a safe value of stress of 70MPa, with a sample able to sustain stresses with values higher than 150MPa with a strain value of around 2%.