3D cranium models of fossils of large canids (*Canis lupus*) from Goyet, Trou des Nutons and Trou Balleux, Belgium

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Abstract: Archaeozoological studies are increasingly using new methods and approaches to explore questions about domestication. Here, we provide 3D models of three archaeological *Canis lupus* skulls from Belgium originating from the sites of Goyet (31,680±250BP; 31,890+240/-220BP), Trou des Nutons (21,810±90BP) and Trou Balleux (postglacial). Since their identification as either wolves or early dogs is still debated, we present these models as additional tools for further investigating their evolutionary history and the history of dog domestication.

Key words: Archaeozoology, Dog, Domestication, Pleistocene, Wolf

SPECIMEN LIST

M3 id(s) of 3D model(s)	Species	Repository institution	3D data acquisition institution	3D data acquisition method	3D Data acquisition facility model	Voxel size of original 3D dataset	3D data acquisition operator	Author of derived 3D surface model
M3#21_Goyet 2860	*Canis lupus*	Royal Belgian Institute of Natural Sciences	UZ Leuven*	Helical CT scan	Siemens Somatom Sensation 64	1*1*1 mm	Walter Coudyzer**	Allowen Evin
M3#22_Trou Balleux no-nr	*Canis lupus*	University of Liège	UZ Leuven*	Helical CT scan	Siemens Somatom Sensation 64	1*1*1 mm	Walter Coudyzer**	Allowen Evin
M3#23_Trou des Nutons 2559-1	*Canis lupus*	Royal Belgian Institute of Natural Sciences	UZ Leuven*	Helical CT scan	Siemens Somatom Sensation 64	1*1*1 mm	Walter Coudyzer**	Allowen Evin

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SCIENTIFIC CONTEXT

Although dogs are perhaps one of the most common domestic animals in the world (and certainly unique in being the first domesticated), little is known about their early history with humans. Identifying the bones and teeth of ancient dogs (and other domestic animals) is often challenging, especially where the differences between wild and domestic forms of the same species form a continuum, which (especially early-on in the process) may be very difficult to distinguish.

Dates and locations for the earliest dogs are still the subject of much debate, with several fossil specimens from e.g. Předmostí (Germonpré et al. 2012), Razboinichya Cave (Ovodov et al. 2011) or Goyet (Germonpré et al. 2009) being suggested as likely candidates.Whereas these identifications were based on basic size criterion and indexes (i.e. domestic dogs being assumed to be smaller than wolves at least at the beginning of the domestication process), more recent studies have also explored shape - especially on the crania or skull (e.g. Boudadi-Maligne and Escarguel 2014; Drake et al. 2015).

The Goyet and Trou des Nutons specimens presented here were found during Edouard Dupont's excavations in Belgian caves during the 1860s. The Goyet specimen has been directly dated to 31,680±250 BP and 31,890+240/-220BP, whilst the specimen from Trou des Nutons is dated to 21,810±90 BP (Germonpré et al. 2009; 2012). The third specimen was discovered in the Trou Balleux (Baileux) cave. Detailed information on this skull is lacking, but it was most probably part of a postglacial vertebrate assemblage (see Germonpré et al. 2009 for more details about the discovery of the specimens). All three specimens have been the subject of several previous studies (Germonpré et al. 2012; Germonpré et al. 2009, 2015) and a 3D model of the Goyet specimen was also included in recent research by Drake et al. (2015). 3D models of all three of these important specimens are presented here as aides for further investigating their evolutionary history and the history of dog domestication.

METHODS

The models result from 3D data acquired at the Universitair Ziekenhuis Leuven campus using a Helical CT scan (Siemens Somatom Sensation 64) with a voxel size of 1 mm isotropic, matrix 512 x 512.

Data for the three crania were extracted semi-automatically with AVIZO 8.1 (Visualization Sciences Group) using the segmentation threshold selection tool. The 3D surface models are provided in .ply format, and can therefore be opened with a wide range of freeware. Additional files specific to ISE-MeshTools software (Lebrun, 2014) are provided in order to visualize the three crania in standard orientation.

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