



PALEO

Revue d'archéologie préhistorique

23 | 2012

Varia

Magdalenian dog remains from Le Morin rock-shelter (Gironde, France). Socio-economic implications of a zootechnical innovation

Myriam Boudadi-Maligne, Jean-Baptiste Mallye, Mathieu Langlais and Carolyn Barshay-Szmidt



Electronic version

URL: <http://journals.openedition.org/paleo/2465>

DOI: 10.4000/paleo.2465

ISSN: 2101-0420

Publisher

SAMRA

Printed version

Date of publication: 15 December 2012

Number of pages: 39-54

ISSN: 1145-3370

Electronic reference

Myriam Boudadi-Maligne, Jean-Baptiste Mallye, Mathieu Langlais and Carolyn Barshay-Szmidt, « Magdalenian dog remains from Le Morin rock-shelter (Gironde, France). Socio-economic implications of a zootechnical innovation », *PALEO* [Online], 23 | 2012, Online since 03 June 2013, connection on 25 July 2020. URL : <http://journals.openedition.org/paleo/2465> ; DOI : <https://doi.org/10.4000/paleo.2465>

This text was automatically generated on 25 July 2020.



PALEO est mis à disposition selon les termes de la licence Creative Commons Attribution - Pas d'Utilisation Commerciale - Pas de Modification 4.0 International.

Magdalenian dog remains from Le Morin rock-shelter (Gironde, France). Socio-economic implications of a zootechnical innovation

Myriam Boudadi-Maligne, Jean-Baptiste Mallye, Mathieu Langlais and Carolyn Barshay-Szmidt

Introduction and main issues

- 1 The domestication of the wolf marks a veritable revolution in the history of human societies and is a fundamental issue in studying the cognitive and technical evolution of recent Palaeolithic hunter-gatherer groups. The first animal to be domesticated was the dog, and this undeniably opened up new possibilities for human groups (e.g., group protection, prestige symbol, hunting assistant, waste elimination *sensu* Clutton-Brock 1977; Morey 1996; Müller 2005; Morey 2010; Vigne 2011). The chronological modalities of this process have raised a lot of controversy (e.g., Germonpré *et al.* 2009; Morey 2010; Ovodov *et al.* 2011; Crockford and Kuzmin 2012; Germonpré *et al.* 2012; Napierala and Uerpmann 2012 for the most recent references). Although some authors consider this process to have begun very early, at the beginning of the Upper Palaeolithic (Germonpré *et al.* 2009; Ovodov *et al.* 2011; Germonpré *et al.* 2012), the domestication of the dog is widely documented at several Tardiglacial sites (e.g., Davis and Valla 1978; Morel and Müller 1997; Chaix 2000; Vigne 2005; Morey 2010; Pionnier-Capitan *et al.* 2011; Napierala and Uerpmann 2012).
- 2 In the archaeological record, it must be noted that distinguishing between dog remains (*Canis familiaris*) and wolf remains (*Canis lupus*) is a delicate task as the morphology and the size of these two canids are similar during the Palaeolithic period. The

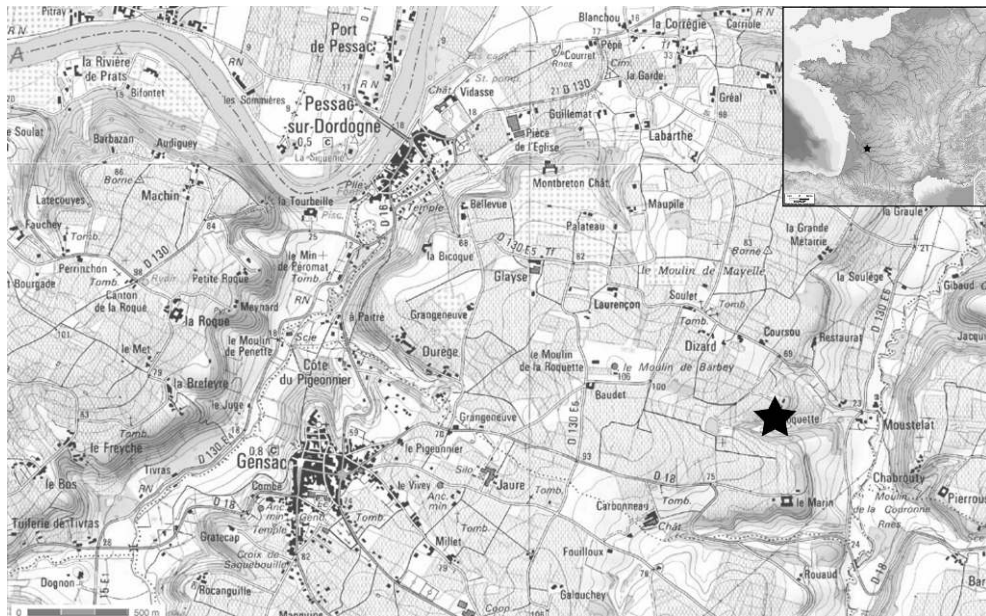
domestication process results in several morphological modifications which are represented by the conservation of neotenic characteristics in domesticated adults and a significant decrease in size (e.g., Hemmer 1990; Morey 1992; Clutton-Brock 1995; Morey 1996, 2010). These changes can occur over a period of several decades (Trut 1999). Size thus generally represents the most diagnostic criterion.

- 3 The analysis of canid remains discovered in Palaeolithic contexts thus represents an essential aspect of prehistoric research in order to describe the modalities of the emergence and the diffusion of the domestication process throughout time and space. Using a considerable biometric reference system made up of western European fossil and modern wolves (Boudadi-Maligne 2010), the reassessment of the canid remains from Abri du Morin is presented here.

The reassessment of the Morin rock-shelter series

- 4 Abri du Morin is located in the commune of Pessac-sur-Dordogne, in Gironde (fig. 1). It was excavated between 1954 and 1958 by Deffarge who described two main sedimentary complexes (Lenoir 1970 - pl. 18), covered by a superficial level containing several pottery shards and other post-glacial remains. Complex A is subdivided by Deffarge into four subcomplexes (from the top to the bottom: I to IV) (Bordes 1959). It yielded a large quantity of lithic and faunal remains attributed to the Final Magdalenian (Bordes and Sonnevile-Bordes 1979). The underlying complex B, subdivided into two subcomplexes (I and II), yielded remains ascribed to the Upper Magdalenian (*ibid.* Lenoir 1970, 1978, 2003). The hypothesis of the Azilianization of the Magdalenian through an internal evolution of the latter was advanced, based on the evolution of the lithic industry (Bordes 1959; Lenoir 1978; Bordes and Sonnevile-Bordes 1979). Abri du Morin also yielded an abundant antler industry, with numerous decorated harpoons, a diversity of decorated objects (Deffarge *et al.* 1975) and a rich fauna (Chauviré 1965; Delpech 1967; Donard 1982; Delpech 1983). The ongoing revision of the lithic and antler series from Le Morin, in the context of the ANR *Magdatis*, has already yielded evidence of typical Laborian hunting projectiles (Langlais *et al.* in press). The current hypothesis thus reveals the presence of a Laborian complex, which had not been recognized during previous research.

Figure 1 – Location of Le Morin rock-shelter

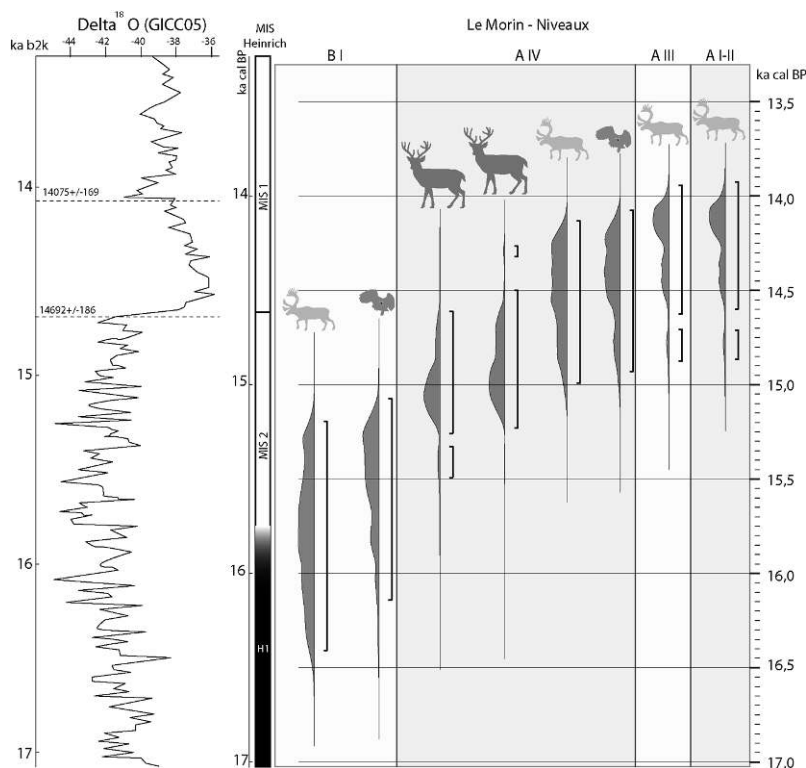


The fauna from Le Morin

- 5 The dominant species represented at Le Morin include the reindeer (*Rangifer tarandus*), bovids and the horse (*Equus caballus*) (Delpech 1983; Kuntz in progress). The presence of the red deer in levels A-IV (*Cervus elaphus*), the wild boar (*Sus scrofa*) and the roe deer (*Capreolus capreolus*) could indicate a more temperate and humid climate during the accumulation of the remains in level B-I.
- 6 The carnivores in complex A include the brown bear (*Ursus arctos*) and the lion (*Panthera sp.*). Small carnivores are represented by the fox (*Vulpes vulpes*), the Arctic fox (*Alopex lagopus*), the lynx (*Lynx sp.*), the wild cat (*Felis silvestris*), the badger (*Meles meles*), the marten (*Martes martes*) and the weasel (*Mustela nivalis*). Three leporidae species are present at the site: the mountain hare (*Lepus timidus*), the brown hare (*Lepus europaeus*) and the European rabbit (*Oryctolagus cuniculus*). Among the rodents, the presence of the beaver (*Castor fiber*), the gopher (*Spermophilus sp.*), the dormouse (*Glis glis*), the large vole (*Arvicola sp.*) and the field mouse (*Apodemus sylvaticus*) is noteworthy. Lastly, hedgehog (*Erinaceus europaeus*) and mole (*Talpa europaea*) insectivore remains were identified. Only one rabbit and one hare remain come from level B. With the exception of the dormouse, the large vole, the field mouse and the mole, the archaeozoological analysis shows that all the other species bear marks of human modification. They were thus brought to the site by the hunter-gatherers.
- 7 Nineteen different bird species were identified at the site (Mourer-Chauviré 1975; Delpech 1983) in two levels. The archaeozoological analysis of the snowy owl remains (*Bubo scandiaca*) shows that this bird of prey was exploited by the Magdalenians (Gourichon 1994). The analysis of the other species is in progress and will reveal their role in Magdalenian exploitation systems (Laroulandie in progress).
- 8 Lastly, salmon (*Salmo salar*), trout (*Trutta fario*) and pike (*Esox lucius*) remains were also identified (Delpech 1967, 1983).

- 9 Until now, the absolute chronology of the Morin site consisted of a single conventional date of $10,480 \pm 200$ BP (Gif-2105) (Delibrias and Evin 1974). This date was nonetheless to be treated with caution as the stratigraphic location of the sample was unknown (Lenoir 1983). During the revision of the sequence, several species underwent direct dating in order to refine the site chronology (fig. 2). In the subcomplex B-I a reindeer remain and a snowy owl remain were dated to 15,800 and 15,000 cal BP. Dating carried out on a red deer and another snowy owl yielded ages ranging between 15,200 and 14,000 cal BP (Szmids *et al.* 2009; Langlais *et al.* 2012). In order to test the assertions concerning more recent occupations (e.g., from the Azilian and the Laborian), direct dates on temperate species are in progress.

Figure 2 - Calibrated dates from the Morin faunal remains. In A I-II on reindeer, in A-III on reindeer, in A-IV on snowy owl, red deer and reindeer and in B-I on snowy owl and reindeer (after Szmids *et al.* 2009 and Langlais *et al.* 2012)



- 10 In the context of the reassessment of the fauna and site chronology, the canid remains were reexamined in order to revisit the question of the presence of the dog raised several decades ago (Suire 1969).

Analysis of the canid remains

- 11 Several studies have previously been carried out on the canid remains. They were first described by Delpech (1967, 1983) and were ascribed to the wolf. Then they were analyzed by Suire (1969) who observed that a small sized lower carnassial tooth could come from a dog, although he expressed doubt concerning the stratigraphic position of this tooth among the other remains. The remains were later studied by Langlois (2000) who reattributed all the dental remains to the wolf (*Canis lupus*) on the basis of the talonid morphology of the lower carnassial. According to Langlois, the small size of the

Canis present at Morin constituted evidence of the decrease in size of this species after the “Würm maximum”.

- 12 Our analysis concerns all the previously studied remains (NR = 24). In addition, during the analysis of small game and carnivores by one of us (J.-B. Mallye), new canid remains were identified (different from the vulpine remains) bringing their total number to 32. These elements are mostly from complex A (tabl. 1) and two thirds of them are from subcomplexes IV and III.
- 13 Different skeletal parts are represented. However, the excavation methods used at the time doubtlessly contributed to the anatomical bias of the collection. Taking account of the identified remains and the distinction between complex A and complex B, the minimum number of individuals is two.

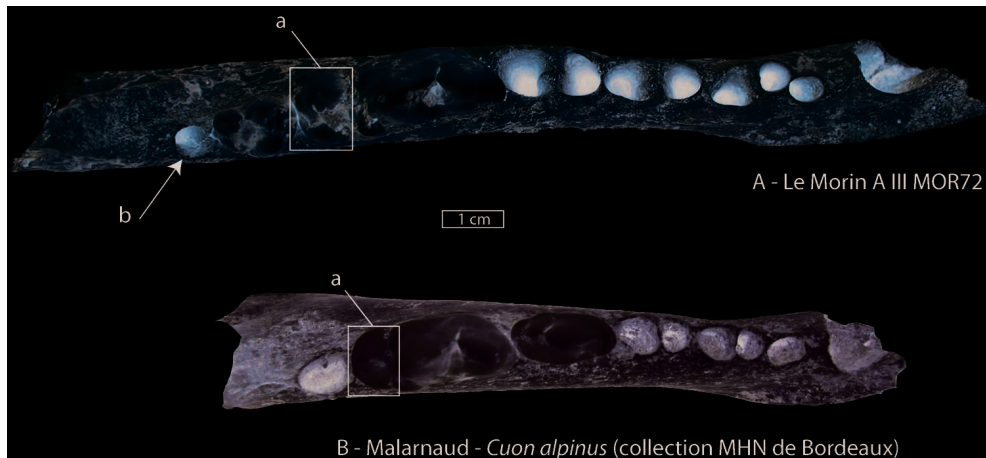
Table 1 – Canid remains from Morin according to the levels ascribed to them during excavations.

Ensemble	Niveau	Parties anatomiques (numéro)	NR (Canidés)
A	A-I	UI3 (MOR73) - MAN (MOR66)	2
	A 1-2	FEM (MOR625) - HUM (MOR67) - PHP (MOR68) - PHM (MOR69)	4
	A-II	UC (MOR89)	1
	A-III	MANT LM1_LM2 (MORAIII) - LM1 (MOR70) - LC (MOR70 - 74) - C (MOR78) - UC (MOR77) - ATL (MOR71) - RAD (MOR507) - FIB (MOR514) - PHP (MOR81 - 90)	11
	A-IV	LI3 (MOR88) - UI1/2 (MOR87) - UC (MOR75) - HUM (MOR82) - RAD (MOR595 - 605) - TIB (MOR579) - MTP (MOR85 - 86) - PHP (MOR83 - 84)	11
B	B-I	MTP (MOR90) - PHM (MOR91 - 92)	3

Generic attribution

- 14 As the presence of the dhole has been attested in several Upper Palaeolithic sites (*e.g.*, Altuna 1983; Perez Ripoll *et al.* 2010), it is essential to confirm the presence or absence of this species in the assemblage studied (Pionnier-Capitan *et al.* 2011). The morphology of the lower carnassials leaves no room for ambiguity. Indeed, on MOR72, the presence of two cusps on the talonid of the first molar (Fig. 3-A-a) as well as the presence of an alveolus for the lower third molar (fig. 3-A-b) very clearly indicates that this hemimandible is attributable to the *Canis* genus and not the *Cuon*. The latter is characterized by a monocusped lower carnassial talonid (fig. 3-B-a) and the absence of the lower third molar (fig. 3-B).
- 15 The morphological study of the dental remains allows us to affirm that they are exclusively from the genus *Canis*

Figure 3 - Comparison of the morphology of the canid mandible from Morin (A) with that of a dhole (*Cuon alpinus*) from the site of Malarnaud (B – NHM of Bordeaux).



- 16 Although some of the post cranial elements are small in size, the recently published criteria for determining the dhole (Perez-Ripoll *et al.* 2010; Pionnier-Capitan *et al.* 2011) were not identified on the canid remains from Le Morin. We thus attribute all of the 32 remains to the genus *Canis*.

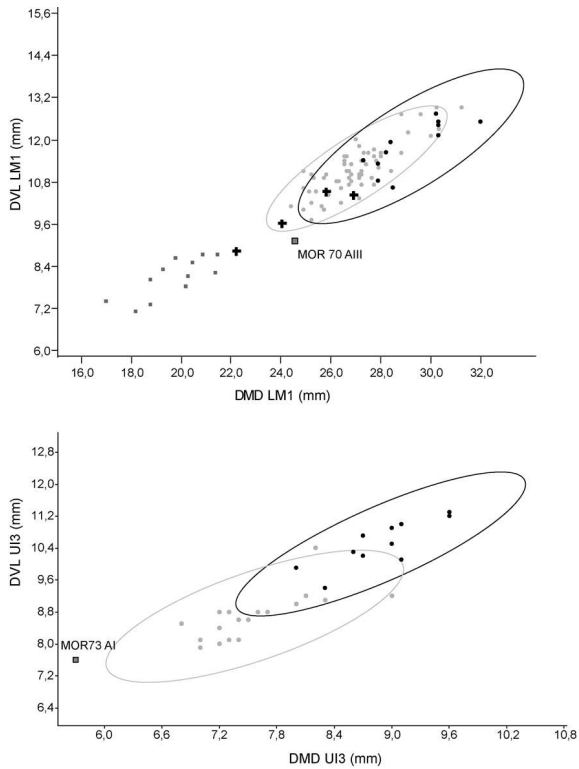
Morphometric analysis

- 17 Considering the small dimensions of certain remains, we conducted a biometric analysis in order to define their specific attribution. We used the measurements described by von den Driesch (1976) in the context of a PhD study (Boudadi-Maligne 2010).
- 18 The measurements of bone and dental remains were compared to three datasets, namely:
- fossil dogs (Nobis 1979; Tchernov & Valla 1997; Chaix 2000; Pionnier-Capitan 2011; Napierala and Uerpmann 2012);
 - fossil wolves dating from the Upper Pleniglacial and the Tardiglacial (Boudadi-Maligne 2010, unpublished);
 - present day populations of European wolves (Boudadi-Maligne 2010, unpublished).
- 19 Among the 32 remains attributed to the genus *Canis*, 19 can clearly be ascribed to the wolf (*Canis lupus*) because of their large size (tabl. 2) which fits well with the known variability of wolves at the end of the Upper Pleistocene (Boudadi-Maligne 2010).
- 20 Seven remains (fig. 4) can be ascribed to the dog (*Canis familiaris*). These are made up of two isolated teeth, a lower carnassial (fig. 4-3) and a third upper incisor (fig. 4-5) and five long bone fragments (fig. 4-1, 2, 4, 6, 7). Bivariate projections of the measurements of the lower carnassial and the upper incisor (fig. 5) indicate that they are both outside the known range of variability for present day and fossil wolves.

Figure 4 - Dog remains (*Canis familiaris*) from Morin. 1: fragment of right femoral shaft; 2: fragment of distal shaft of right humerus; 3: right lower carnassial; 4: fragment of left tibia shaft; 5: third left upper incisor; shaft fragments of a left (6) and right (7) radius. The skeletal remains are shown in anterior (A), medial (M), posterior (P), lateral (L) view and dental remains in occlusive (O), vestibular (V), lingual (L), distal (D) and / or mesial (Mes) view.



Figure 5 - Bivariate projections of buccolingual (DVL) and mesiodistal (DMD) diameters of the lower carnassial (top) and of the third upper incisor (bottom) compared to data from fossil dogs (Nobis 1979; Tchernov and Valla 1997; Chaix 2000; Pionnier-Capitan *et al.* 2011; Napierala and Uerpmann 2012; Boudadi-Maligne unpublished), late Pleistocene wolves (Boudadi Maligne 2010, unpublished) and modern wolves (Boudadi Maligne unpublished). The 95% confidence ellipses are shown.



- 21 In order to quantify these differences, the probabilistic distances (Maureille *et al.* 2001) were calculated between these two teeth and their counterparts from our reference collection of present day and fossil wolves. This distance is calculated according to the formula adapted to small samples (Santos *in* Scolan *et al.* 2011). These data (tabl. 3) confirm that the lower carnassial and the upper third incisor from Le Morin rock-shelter are outside the known variability range for fossil and present day wolves. This distance is even more marked if only the robustness index (ROB) of these teeth is taken into account: product of the mesio-distal diameter (DMD) and the vestibulo-lingual diameter (DVL).

Table 2 - Measurements in mm of canid remains from Morin rock-shelter compared with those obtained on late Pleistocene and modern wolves. In grey the remains attributed to the dog (*Canis familiaris*) are shown. The abbreviations used are: DMD, mesiodistal diameter; DVL, buccolingual diameter; B and DT, width (transverse diameter), DAP, anterior-posterior diameter, GL, length; med, medial trochlea of the humerus; lat, lateral trochlea; m, measured in the middle of the shaft d, distal; p, proximal.

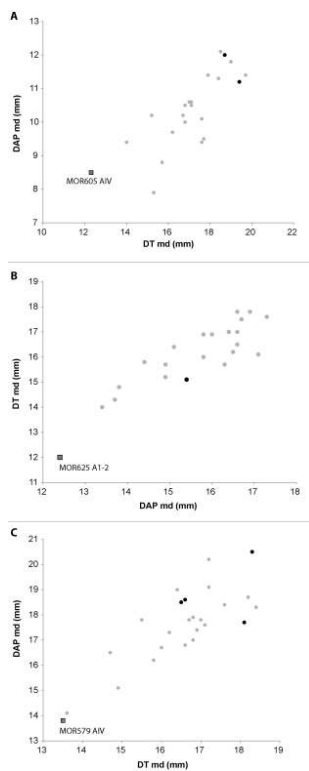
Anatomie	Mesures	Le Morin					Loups pléni-glaciaires (Boudadi-Maligne 2010 et inédit)			Loups actuels européens (Boudadi-Maligne inédit)		
		MOR 88	MOR 74	MOR 76	MOR 72	MOR 70	N	moy.	min - max	N	moy.	min / max
Dents	DMD LI3	6,3					5	7,5	7,2 - 7,8	19	6,3	5,7 - 8,2
	DVL LI3	7,0					5	8,1	7,5 - 8,7	19	6,7	5,7 - 7,7
	DMD LC	13,2					10	13,4	12,2 - 14,8	20	13,3	11,3 - 14,8
	DVL LC	8,4					10	9,2	8,3 - 10,3	20	9,3	8,1 - 11,1
	DMD LM1	28,5					10	29,3	27,3 - 32,0	20	27,0	24,9 - 31,2
	DVL LM1	10,2					10	11,9	10,8 - 12,7	20	11,2	9,7 - 12,9
	DMD LM2	11,1					7	12,0	10,0 - 12,3	20	11,1	10,1 - 11,9
	DVL LM2	8,7					7	9,2	8,1 - 9,8	20	8,2	7,7 - 9,5
	DMD UI3	7,6					11	8,9	8,0 - 9,6	18	7,6	7,0 - 9,0
	DVL UI3	5,7					11	10,5	9,4 - 11,3	18	8,7	7,9 - 10,4
	DMD UC	14,1					8	14,2	12,2 - 15,2	20	13,2	10,6 - 15,0
	DVL UC	7,6					8	8,9	8,4 - 9,7	20	8,7	7,7 - 9,9
Humerus	Bd	41,3					5	43,8	39,8 - 48,2	20	42,8	37,4 - 49,1
	DAPd med	33,7					2	35,4	33,0 - 37,7	20	34,0	29,5 - 37,8
	DAPd lat	25,9					4	24,8	21,6 - 28,1	20	27,1	23,7 - 30,2
Radius	DTm	12,3					2	19,1	18,7 - 19,4	19	17,1	14,0 - 19,7
	DAPm	8,5					2	11,6	11,2 - 12,0	19	10,3	7,9 - 12,1
Femur	DTm	12,0					3	16,8	15,4 - 17,7	20	16,3	14,0 - 17,8
	DAPm	12,4					3	17,9	15,1 - 19,3	20	15,7	13,4 - 17,1
Tibia	DTm	13,5					5	16,9	15,2 - 18,1	20	16,5	13,6 - 18,4
	DAPm	13,8					4	18,8	17,7 - 20,5	20	17,5	14,1 - 20,2
Phalange I	GL	36,3					12	34,8	33,1 - 37,3	80	33,7	30,0 - 37,1
	Bp	11,7					12	11,4	9,9 - 12,2	80	10,9	9,8 - 12,3
	Bd	10,0					12	9,6	8,0 - 10,5	80	9,1	8,0 - 10,3
Phalange II	GL	22,5					15	23,5	21,3 - 25,0	80	23,5	19,9 - 26,0
	Bp	10,4					15	10,1	8,6 - 11,1	80	9,6	8,3 - 10,7
	Bd	9,7					15	9,8	8,7 - 10,9	80	9,7	8,3 - 11,4

Table 3 - Probabilistic distances (dpx). For each comparison group, the mean and standard deviation are shown. Highly significant probabilistic distances, excluding the values obtained on the Morin remains from the variability of the reference groups, are represented in grey.

n		Loups modernes européens		Loups pléni-glaciaires		Morin	
		LM1	UI3	LM1	UI3	LM1	UI3
		66	18	10	11		
DMD	moyenne	27,0	7,6	29,3	8,9	24,6	5,7
	écart type	1,44	0,56	1,53	0,49		
	dpx	0,10	0,004	0,01	9,50*10⁻⁵		
DVL	moyenne	11,2	8,7	11,9	10,5	9,1	7,6
	écart type	0,71	0,60	0,63	0,59		
	dpx	0,004	0,09	0,002	8,29*10⁻⁴		
ROB	moyenne	302,47	65,97	349,75	93,48	223,86	43,32
	écart type	34,14	8,84	35,18	9,90		
	dpx	0,03	0,02	0,008	6,71*10⁻⁴		

- 22 In the same way, for three long bone shaft fragments, the biometric data shows significant differences for fossil and modern wolves (fig. 6). Two other remains, distal shaft fragments from a radius and a humerus, not measurable in the strict sense of von den Driesch (1976), present very small transverse and anterior-posterior diameters. In addition, the thin cortical thickness of these bones is not compatible with that observed on wolf long bones. On this type of element, biometric reference data are extremely rare, which prevents any quantitative comparison. Nonetheless, the proportions of these pieces associate them with the dog rather than the wolf.

Figure 6 - Bivariate projections of anterior-posterior (DAP) and transverse (TD) diameters in the middle of the diaphysis of the radius (A), femur (B) and tibia (C) of the Morin canids compared with data from modern wolves (grey circles) and late Pleistocene wolves (black circles).



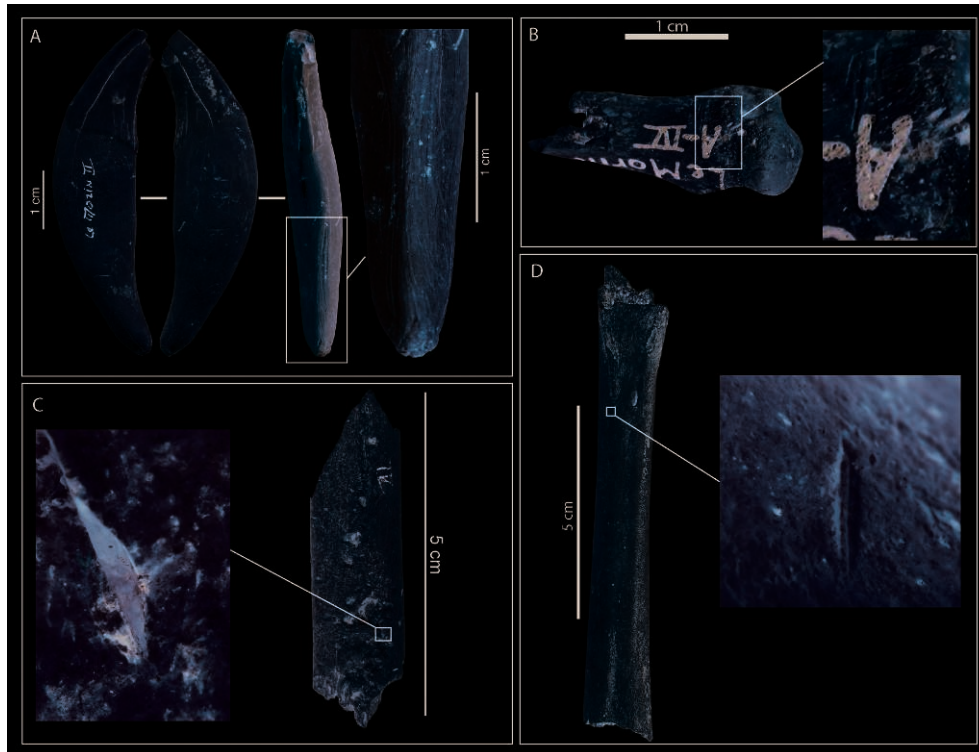
- 23 Lastly, six remains were not attributed to either species, as we did not have access to comparative elements. These remains are three distal extremities of a metapodial, two incisors and a fibula shaft fragment.

Archaeozoological analysis

- 24 All the pieces were observed with a stereomicroscope LEICA Z16 APO, with minimum magnifications of $\times 40$ in order to identify any marks likely to provide information concerning the origin and the status of the remains at the site. Ten of the wolf remains bear human-induced marks. These are scraping marks identified on the root of an upper right canine (fig.7 - A) and a lower right canine. These marks can be interpreted as preparation of the tooth before perforation. Other marks were also identified on phalanges and on the mandible, signifying skinning activities. Lastly, cutmarks identified on a radius demonstrate defleshing of the bone.
- 25 Cutmarks were also identified on canid remains (wolf or dog) from two metapodials (fig.7 - B) as well as on the crowns from two incisors. These marks can be linked to skinning when the skin is pulled over the head (Mallye 2011). Lastly, a fibula fragment bearing cutmarks can be linked to defleshing.
- 26 Dog long bones bear anthropogenic marks. These are cutmarks, located on the posterior face of a right femur (fig.7 - D), but also on the posterior face of a radius and a tibia shaft. Lastly, a 3 mm long flint fragment was also found wedged in a radius shaft (fig.7 - C).

- 27 These marks demonstrate the exploitation of both the dog and wolf by Tardiglacial human groups.

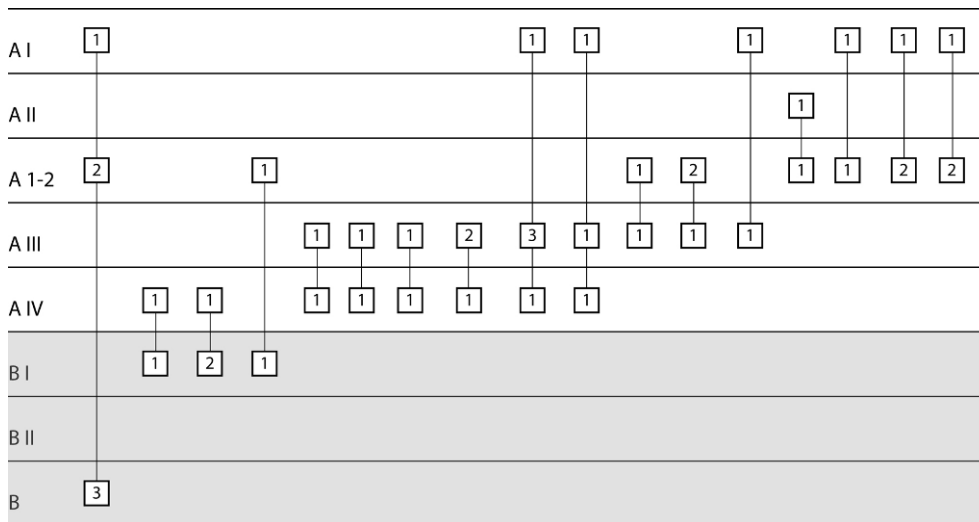
Figure 7 - Examples of anthropogenic marks on *Canis* remains from Le Morin. A: right upper canine of wolf (*Canis lupus*) with scraping on the root, focusing in on the distal portion; B: distal part of a canid metapodial (*Canis sp.*) with cutmarks; C: fragment of 3 mm-long flint stuck in the posterior diaphysis of the radius of a dog (*Canis familiaris*), D: right femur of dog (*Canis familiaris*) with cutmarks on the posterior surface.



Dating the Morin dog remains?

- 28 During the reassessment of the site, an analysis of systematic refits of ungulate dental series was carried out (J.-B. Mallye, fig. 8) resulting in connections and dental near connections. Thirty-six of these were pieces from the same complexes. In the other cases, these connections and near connections concern mainly the pieces from the different A subcomplexes. Some rare connections link the two complexes A and B. Coupled with a revision of the lithic industries (M. Langlais), the results obtained from the analysis of the dispersal of the connected faunal pieces show that the different levels recorded during excavations correspond to artificial constructs rather than to stratigraphic subdivisions. Thus, in order to discuss the cultural attribution of the identified canid remains and thereby the spread of domestication among Palaeolithic groups, it appeared essential to carry out direct dates on the Morin dog remains.

Figure 8 – Refits carried out on ungulate dental remains. The numbers indicate the quantity of remains refitted.



- 29 Four samples were sent to the ORAU (*Oxford Radiocarbon Accelerator Unit*). These four remains, made up of two bones and two dental remains, were first molded following the protocol established by the ORAU and photographed on all sides. These remains had not been coated with conservation or consolidation products. The first two, a femur shaft and a radius shaft, did not contain enough collagen to be dated and two teeth attributed to *Canis familiaris* (lower M1 and upper I3) were thus submitted instead.
- 30 They were treated using the standard collagen extraction method, which includes a pretreatment phase of ultrafiltration (Bronk Ramsey *et al.* 2002, 2004; Brock *et al.* 2010). The radiocarbon ages expressed in non-calibrated BP were obtained using the Libby value for the half-life of carbon 14 and corrected with natural isotopic splitting. The collagen level, elementary measurements and the stable isotope measurements for both the dated samples are within the normal margins (Van Klinken 1999). The calibration of the dates was conducted using the OxCal v4.1.7 program developed by Bronk Ramsey (2009, 2010), based on the atmospheric data from IntCal09 (Reimer *et al.* 2009).
- 31 The lower carnassial from A III (OxA-23628) is dated to $12,450 \pm 55$ BP or 15,005-14,155 (95.4%) cal BP and the third upper incisor found in A I (OxA-23627) to $12,540 \pm 55$ BP or 15,114-14,237 (95.4%) cal BP.

The domestication of the wolf in Western Europe

- 32 In spite of widespread interest in the domestication of the wolf, very few dog remains have been directly dated. Indeed, only four Tardiglacial sites can be cited (fig. 9): Saint-Thibaud-de-Couz in Savoie (Chaix 2000), le Pont d'Ambon in Dordogne (Célérier *et al.* 1999), Kesslerloch in Switzerland (Napierala and Uerpmann 2012) and Bonn-Oberkassel in Germany (Baales 2006). The dog remains from Pont d'Ambon and Saint Thibaut de Couz yield dates from the first half of the recent Dryas for the first and from the recent Dryas-Preboreal for the second. They are associated with complexes from the end of the Palaeolithic, probably Laborian (Célérier *et al.* 1999; Chaix 2000). The remains from Bonn-Oberkassel and Kesslerloch dated to the end of the Bölling and the Alleröd were found in a Magdalenian context (Baales 2006, Napierala and Uerpmann 2012). Dog

remains elsewhere which have not benefited from direct dating are associated with the same technocomplexes: Hauterive-Champréveyres in Switzerland (Morel and Müller 1997), Erralla in Spain (Altuna *et al.* 1985; Vigne 2005) and Montespan in Haute-Garonne (Pionnier-Capitan *et al.* 2011). The dates obtained on the Morin dog remains confirm the presence of this canid in an Upper Magdalenian context and the spread of this zotechnical innovation in Western Europe from the Bölling onwards.

- 33 The biometric analysis of the Morin dog remains reveals the small size of the specimens, pointing towards profound transformations in comparison to their wild ancestors. Such modifications were described elsewhere following experimental domestication research on canids (Trut 1999). In controlled conditions this type of modification is visible very early on, after about 20 to 100 generations, which represents several decades (Trut 1999; Arbuckle 2005). Therefore, given the radiometric dates currently available and the presence of several C14 plateaux (fig. 9), it is not easy to perceive the different stages of this wolf to dog transformation.
- 34 However, the size of the Taridglacial dogs shows that the domestication process is already fully complete. Certain authors suggest that domestication appeared during the Upper Palaeolithic (Germonpré *et al.* 2009; Ovodov *et al.* 2011; Germonpré *et al.* 2012), but it is noteworthy that, as other authors have suggested (Detry and Cardoso 2010; Morey 2010; Napierala and Uerpmann 2012), no decrease in size has been recorded in canid remains from pre-Magdalenian periods. Arguments in favor of early domestication must thus be treated with caution. Domestication seems to be rooted either in Middle Magdalenian societies (cf. Erralla or Montespan), or in a different cultural substratum nearly contemporaneous with the Magdalenian.

Figure 9 - Summary of the dates conducted directly on Late Glacial dog remains. Dates (cal BP) were obtained from the program OxCal v4.1.7 developed by Bronk Ramsey (2009, 2010).



Discussion et conclusion

Early dates

- 35 Several remains ascribed to the genus *Canis* were identified at Morin. Among these, seven present dimensions clearly outside the range of variability of fossil and modern wolves. These are not small Tardiglacial wolves but genuine dogs living alongside Upper Magdalenian hunter-gatherers from the Bölling onwards. Moreover, the dates obtained are relatively similar even though the remains are from different subcomplexes. It is thus reasonable to assume that they are from the same specimen.

Waste elimination

- 36 At Morin, the presence of ungulate remains with tooth marks made by a medium-sized carnivore could also indicate the proximity of Man and dog. However, contrary to expectations (e.g., Klippel *et al.* 1987; Morey and Klippel 1991), there are no digested bones at the site. It is nonetheless possible that unidentifiable bones such as these were considered to be of little or no archaeological interest during excavations. If such bones existed, they were not collected.

Man's best friend?

- 37 The examination of dog bone surfaces revealed the presence of butchery marks. This animal was thus treated as a meat resource in the same way as other species. This calls into question the status of this animal in hunter-gatherer groups. Indeed, during the Upper Magdalenian, the treatment of human remains indicates a complex relationship with death. Tombs are rare and human remains are frequently mixed with faunal remains. In addition, they can also bear marks of human intervention (e.g., Gambier 1990/1991; Le Mort and Gambier 1992; Gambier 1995).
- 38 Can we therefore imagine that the marks described on the Morin dog remains demonstrate an identical status to that of humans, or at least different from the hunted species? If the dog was a food resource during the Upper Magdalenian, did the presence of dog represent planned resource management by keeping a live stock of meat?

Other changes in societies: the dog as a hunting aid?

- 39 Although the dog is traditionally associated with hunting activities, ethnography provides contradictory insights (Poplin *et al.* 1986; Gautier 1990; Vigne 2004). Some groups use canids as hunting aids, others for accompanying hunters, whereas others send the canids back to camp when the hunters leave (synopsis in Digard 2006, 2009).
- 40 If Magdalenian groups possessed dogs, did new hunting strategies accompany this zotechnical innovation? The reply to this question is complex given the paltry data provided by the archaeological record. However, two observations can be recalled here: the evolution of hunting arms and the integration of small game in the diet. In addition to the presence of dogs, hunting weapons during the Upper Magdalenian demonstrated a redeployment of lithic points. Taking the example of Morin, the successive development of shouldered points then Laugerie-Basse type leaf points underlines an

internal Magdalenian dynamic which initiates in a way the emergence of Azilian backed points. Shaft types or point hafting remain widely unknown and underestimated due to the absence of taphonomical conditions propitious to wood preservation. It would be interesting to conduct an experimental program to tackle the thorny question of the use of the spear thrower and/or the bow. However, it would be simplistic to consider the dog as an integral element of the hunter with a bow. If it difficult to directly correlate the hypothesis of the dog as hunting aid with the evolution of weapons, it is worth recalling that at the same time, small game, such as birds, leporids, small carnivores and large rodents are more intensively exploited (e.g., Stiner *et al.* 1999, 2000; Laroulandie 2000; Cochard 2004; Hocket and Haws 2005; Costamagno *et al.* 2008). It is thus legitimate to question the dog's role in the acquisition strategies of these small animals.

Towards a systemic vision

- 41 Correlating these events does not necessarily signify that there is a causal relationship between them and these hypotheses remain difficult to prove. The systematic search for clues such as the presence of eaten and digested remains in archaeological sites where dog remains have been identified as well as research concerning the association between dog remains and hunted species will lead to a better understanding of the role played by the dog among the first human groups to have domesticated it and will entail a more systemic vision of the domestication process.

The authors wish to thank the UMR 5199 PACEA as well as the Treilles foundation for financing this research. We also wish to thank the Magdatis project, n° ANR 2011 BSH3 005 02 and all the personnel involved as well as the Bordeaux Muséum d'Histoire naturelle. We are grateful to Michel Lenoir for the documentation and information that he supplied and to an anonymous reviewer and Françoise Delpech for different comments that contributed to improving this paper.

BIBLIOGRAPHY

- ALTUNA J. 1983 - Hallazgo de un Cuon (*Cuon alpinus* Pallas) en Obarreta, Gorbea (Viscaya), *Kobie*, XIII, p.141-158.
- ALTUNA J., BALDEON A. & MARIEZKURRENA K. 1985 - *Cazadores magdalenenses en la Cueva de Erralla (Cestona, Pais Vasco)*. Munibe (Antropologia-Arkeologia), Vol. 37, 206 p.
- ARBUCKLE B. S. 2005 - Experimental animal domestication and its application to the study of animal exploitation in Prehistory, *In* : J.-D. Vigne, J. Peters and D. Helmer (Ed.), *The first Steps of Animal Domestication. New archaeological approchs. Proceedings of the 9th ICAZ Conference, Durham 2002* Oxbow Books, p. 18-33.
- BAALES M. 2006 - Environnement et archéologie durant le Paléolithique final dans la région du Rhin moyen (Rhénanie, Allemagne) : conclusions des 15 dernières années de recherches, *L'Anthropologie*, 110, p.418-444.

- BORDES F. 1959 - Bordeaux, *Gallia préhistoire*, 2(2), p.156-167.
- BORDES F. & SONNEVILLE-BORDES (de) D. 1979 - L'azilianisation dans la vallée de la Dordogne. Les données de la Gare de Couze (Dordogne) et de l'abri Morin (Gironde), In: D. de Sonneville-Bordes (Ed.), *La fin des temps glaciaires en Europe. Chronostratigraphie et écologie des cultures du Paléolithique final*, CNRS, (N° 271), p. 449-459.
- BOUDADI-MALIGNE M. 2010 - *Les Canis pléistocènes du Sud de la France : approche biosystématique, évolutive et biochronologique*. Bordeaux : Université Bordeaux 1, 451 p., Thèse de doctorat.
- BROCK F., HIGHAM T., DITCHFIELD P., BRONK RAMSEY C. 2010 - Current pretreatment methods for AMS radiocarbon dating at the Oxford Radiocarbon Accelerator Unit (ORAU). *Radiocarbon*, 52(1), p. 103-112.
- BRONK RAMSEY C. 2009 - Bayesian analysis of radiocarbon dates. *Radiocarbon*, 51(1), p. 337-360
- BRONK RAMSEY C. 2010. OxCal Program v4.1.7. Radiocarbon Accelerator Unit, University of Oxford.
- BRONK RAMSEY C., HIGHAM T. F. G., BOWLES A. & HEDGES R. E. M. 2004 - Improvements to the pretreatment of bone at Oxford, *Radiocarbon*, 46, p.155-163.
- BRONK RAMSEY C., HIGHAM T. F. G., OWEN D. C., PIKE A. W. G. & HEDGES R. E. M. 2002 - Radiocarbon dates from the Oxford AMS system: Archaeometry datelist 31, *Archaeometry*, 44(3, suppl. 1), p.1-149.
- CÉLÉRIER G., TISNERAT N. & VALLADAS H. 1999 - Données nouvelles sur l'âge des vestiges de chien à Pont d'Ambon, Bourdeilles (Dordogne), *PALEO*, 11, p.163-165.
- CHAIX L. 2000 - A Preboreal dog from the northern Alps (Savoie, France), In : S. J. Crockford (Ed.), *Dogs through time : an archaeological perspective*. BAR International Series 889, (Proceedings of the 1st ICAZ Symposium on the History of the Domestic Dog. Eight Congress of the International Council for Archaeozoology (ICAZ98) August 23-29. Victoria, B.C., Canada), p. 49-59.
- CHAUVIRÉ C. 1965 - Les oiseaux du gisement magdalénien du Morin (Gironde), *89e Congrès des Sociétés Savantes*, Lyon, p.255-266.
- CLUTTON-BROCK J. 1977 - Man-made dogs, *Science*, 197, p.1340-1342.
- CLUTTON-BROCK J. 1995 - Origins of the dog: domestication and early history, In: J. Serpell (Ed.), *The domestic dog. Its evolution, behaviour and interactions with people*. Cambridge, Cambridge University Press, p. 7-20.
- COCHARD D. 2004 - *Les léporidés dans la subsistance paléolithique du Sud de la France*. Bordeaux: Université Bordeaux 1, 354 p., Thèse de Doctorat.
- COSTAMAGNO S., COCHARD D., LAROULANDIE V., CAZALS N., LANGLAIS M., VALDEYRON N., DACHARY M., BARBAZA M., GALOP D., MARTIN H. & PHILIBERT S. 2008 - Nouveaux milieux, nouveaux gibiers, nouveaux chasseurs ? Évolution des pratiques cynégétiques dans les Pyrénées du Tardiglaciaire au début du Postglaciaire, *Bulletin de la Société Préhistorique Française*, 105(1), p. 17-27.
- CROCKFORD S. J. & KUZMIN Y. V. 2012 - Comments on Germonpré et al. *Journal of Archaeological Science* 36, 2009 "Fossil dogs and wolves from Palaeolithic sites in Belgium, the Ukraine and Russia: Osteometry, ancient DNA and stable isotopes", and Germonpré, Lazkikova-Galetova, and Sablin, *Journal of Archaeological Science* 39, 2012 "Palaeolithic dog skulls at the Gravettian Predmosti site, The Czech Republic, *Journal of Archaeological Science*, in press, p.xx.

- DAVIS S. & VALLA F. R. 1978 - Evidence for domestication of the dog 12,000 years ago in the Natufian of Israel, *Nature*, 276, p.608-610.
- DEFFARGE R., LAURENT P. & DE SONNEVILLE-BORDES D. 1975 - Art mobilier du Magdalénien supérieur de l'Abri Morin à Pessac-sur-Dordogne (Gironde), *Gallia préhistoire*, 18(1), p.1-64.
- DELIBRIAS G. & EVIN J. 1974 - Sommaire des datations 14C concernant la préhistoire en France, *Bulletin de la Société Préhistorique française*, tome 71(N. 5), p.149-156.
- DELPECH F. 1967 - *Recherches paléontologiques concernant quelques gisements du Magdalénien VI : stations de la Gare de Couze (Dordogne), du Morin (Gironde) et de Duruthy (Landes)*. Bordeaux, 202 p., Thèse de Doctorat en Géologie approfondie, option Paléontologie.
- DELPECH F. 1983 - *Les faunes du Paléolithique supérieur dans le sud-ouest de la France*. Paris, Vol. 6, 453 p.
- DETRY C. & CARDOSO J. L. 2010 - On some remains of dog (*Canis familiaris*) from the Mesolithic shell-middens of Muge, Portugal, *Journal of Archaeological Science*, 37, p.2762-2774.
- DIGARD J.-P. 2006 - Essai d'ethno-archéologie du chien, In : *Ethnozootechnie - Le Chien : domestication raciation, utilisations dans l'histoire*, n°78, p.33-40.
- DIGARD J.-P. 2009 - *L'homme et les animaux domestiques. Anthropologie d'une passion*. Fayard, 325 p.
- DONARD E. 1982 - *Recherches sur les léporidés quaternaires (Pléistocène moyen et supérieur, Holocène)*: Université Bordeaux 1, 161 p., Thèse de Doctorat.
- GAMBIER D. 1990/1991 - Les vestiges humains du gisement d'Isturitz (Pyrénées-Atlantiques). Etude anthropologique et analyse des traces d'action humaine intentionnelle, *Antiquités Nationales*, 22/23, p.9-26.
- GAMBIER D. 1995 - Les pratiques funéraires au Magdalénien dans les Pyrénées françaises, In: *Pyrénées préhistoriques : Arts et sociétés : Actes du 118e Congrès National des Sociétés Historiques et Scientifiques*, 1993. Pau, (71), p. 263-277.
- GAUTIER A. 1990 - *La domestication. Et l'homme créa l'animal...*Errance ed, 277 p.
- GERMONPRÉ M., LÄZNIKOVA-GALETOVA M. & SABLIN M. V. 2012 - Palaeolithic dog skulls at the Gravettian Predmosti site, the Czech Republic, *Journal of Archaeological Science*, 39(1), p.184-202.
- GERMONPRÉ M., SABLIN M. V., STEVENS R. E., HEDGES R. E. M., HOFREITER M., STILLER M. & DESPRÈS V. R. 2009 - Fossil dogs and wolves from Paleolithic sites in Belgium, The Ukraine and Russia : osteometry, ancient DNA and stable isotopes, *Journal of Archaeological Science*, 36, p. 473-490.
- GOURICHON L. 1994 - *Les Harfangs (Nyctea scandiaca L.) du gisement magdalénien du Morin (Gironde). Analyse taphonomique des restes d'un rapace nocturne chassé et exploité par les hommes préhistoriques*. Lyon: Université Lumière-Lyon II, Mémoire de Maîtrise (Ethnologie).
- HEMMER H. 1990 - *Domestication. The decline of environmental appreciation*. Cambridge University Press, 217 p.
- HOCKETT B. & HAWS J. A. 2005 - Nutritional ecology and the human demography of Neandertal extinction, *Quaternary International*, 137, p.21-34.
- KLIPPEL W. E., SNYDER L. M. & PARMALEE P. W. 1987 - Taphonomy and Archaeologically recovered Mammal Bone from Southeast Missouri, *Journal of Ethnobiology*, 7(2), p.155-169.
- LANGLAIS M., COSTAMAGNO S., LAROULANDIE V., PÉTILLON J.-M., DISCAMPES E., MALLYE J.-B., COCHARD D. & KUNTZ D. 2012 - The evolution of magdalenian societies in South-West France

between 18,000 and 14,000 cal BP: changing environments, changing tool kits, *Quaternary International*, 272-273, p. 138-149.

LANGLAIS M., BONNET-JACQUEMENT P., DETRAIN L., VALDEYRON N. (sous presse) – Le Laborien : ultime sursaut technique du cycle évolutif paléolithique du sud-ouest de la France ? Mémoire de la SPF.

LANGLOIS A. 2000 - *Contribution à l'étude phylogénique du genre Canis Linné, 1758 du Pléistocène moyen et supérieur*: Université Bordeaux I, 98 p.

LAROULANDIE V. 2000 - *Taphonomie et Archéozoologie des Oiseaux en grotte : Applications aux sites Paléolithiques du Bois-Ragot (Vienne), de Combe Saunière (Dordogne) et de La Vache (Ariège)*. Bordeaux : Université de Bordeaux I, 395 p.

LE MORT F. & GAMBIER D. 1992 - Diversité du Traitement des Os Humains au Magdalénien : Un Exemple Particulier, le Cas du Gisement du Placard (Charente). In: J.-P. Rigaud, H. Laville et B. Vandermeersch (Ed.), *Actes du colloque Le Peuplement Magdalénien, Chancelade, 10-15 oct.1988*. Paris, Éditions CNRS, p. 29-40.

LENOIR M. 1970 - *Recherches sédimentologiques concernant quelques gisements magdaléniens de Guyenne occidentale*. Bordeaux: Faculté des Sciences de l'Université de Bordeaux, 2 tomes, Thèse de Doctorat.

LENOIR M. 1978 - Les grattoirs-burins du Morin et du Roc de Marcamps (Gironde), *Bulletin de la Société Préhistorique de France*, 75(3), p.73-82.

LENOIR M. 1983 - *Le Paléolithique des basses vallées de la Dordogne et de la Garonne*: Université Bordeaux 1, 2 tomes, Thèse de Doctorat d'État.

LENOIR M. 2003 - Le Magdalénien à pointes à cran de Gironde, In: E. Ladier (Ed.), *Les pointes à cran dans les industries lithiques du Paléolithique supérieur récent, de l'oscillation de Lascaux à l'oscillation de Bölling (table ronde de Montauban, 2002)* Préhistoire du Sud-Ouest, (suppl. 6), p. 73-83.

MALLYE J.-B. 2011 - Réflexion sur le dépouillement des petits carnivores en contexte archéologique: Apport de l'expérimentation, *Archaeofauna*, 20, p.7-25.

MAUREILLE B., ROUGIER H., HOUËT F. & VANDERMEERSCH B. 2001 - Les dents inférieures du néandertalien Regourdou 1 (site de Regourdou, commune de Montignac, Dordogne) : analyses métriques et comparatives, *Paléo*, 13, p.183-200.

MOREL P. & MÜLLER W. 1997 - *Hauterive-Champréveyres, 11. Un campement magdalénien au bord du lac de Neuchâtel : étude archéozoologique (secteur 1)*. Neuchâtel. Archéologie neuchâteloise, Vol. 23, 149 p.

MOREY D. F. 1992 - Size, shape and development in the Evolution of the Domestic Dog, *Journal of Archaeological Science*, 19, p.181-204.

MOREY D. F. 1996 - L'origine du plus vieil ami de l'homme, *La Recherche*, 288, p.72-77.

MOREY D. F. 2010 - *Dogs. Domestication and the development of a social bond*. Cambridge University Press, 356 p.

MOREY D. F. & KLIPPEL W. E. 1991 - Canid scavenging and deer bone survivorship at an Archaic period site in Tennessee, *Archaeozoologia*, IV/1, p.11-28.

MOURER-CHAUVIRÉ C. 1975 - *Les oiseaux du Pléistocène moyen et supérieur de France*: Faculté des Sciences de Lyon, 624 p., Thèse de Doctorat.

MÜLLER W. 2005 - The domestication of the wolf - the inevitable first?, In: J.-D. Vigne, J. Peters and D. Helmer (Ed.), *The first Steps of Animal Domestication. New archaeological approchs. Proceedings of the 9th ICAZ Conference, Durham 2002* Oxbow Books, p. 34-40.

NAPIERALA H. and UERPMANN H. P. 2012 - A "new" Palaeolithic Dog from Central Europe, *International journal of osteoarchaeology*, 22 (2), p.127-137.

NOBIS G. 1979 - Der älteste Hausbund lebte vor 14000 Jahren, *Umschau*, 79, p.610.

OVODOV N. D., CROCKFORD S. J., KUZMIN Y. V., HIGHAM T. F., HODGINS G. W. L. & VAN DER PLICHT J. 2011 - A 33,000-year-old incipient dog from the Altai mountains of Siberia: Evidence of the earliest domestication disrupted by the Last Glacial Maximum, *PLoSone*, 6(7), p.1-7.

PEREZ RIPOLL M., MORALEZ PEREZ J. V., SANCHIS SERRA A., AURA TORTORA J. E. & SARRION MONTANANA I. 2010 - Presence of the genus *Cuon* in upper Pleistocene and initial Holocene sites of the Iberian Peninsula: new remains identified in archaeological contexts of the Mediterranean region, *Journal of Archaeological Science*, 37(3), p.437-450.

PIONNIER-CAPITAN M., BÉMILLI C., BODU P., CÉLÉRIER G., FERRIÉ J.-G., FOSSE P., GARCIA M. & VIGNE J.-D. 2011 - New evidence for Upper Palaeolithic small domestic dogs in South-Western Europe, *Journal of Archaeological Science*, 38(9), p.2123-2140.

POPLIN F., POULAIN T., MÉNIEL P., VIGNE J.-D., GEDDES D. et HELMER D. 1986 - Les débuts de l'élevage en France, In : J.-P. Demoule et J. Guilaine (Ed.), *Le néolithique de la France. Hommage à G. Bailloud*. Paris, Picard, p. 37-51.

REIMER P. J., BAILLIE M. G. L., BARD E., BAYLISS A., BECK J. W., BLACKWELL P. G., BRONK RAMSEY C., BUCK C. E., BURR G. S., EDWARDS R. L., FRIEDRICH M., GROOTES P. M., GUILDERSON T. P., HAJDAS I., HEATON T. J., HOGG A. G., HUGHEN K. A., KAISER K. F., KROMER B., MCCORNAC F. G., MANNING S. W., REIMER R. W., RICHARDS D. A., SOUTHON J. R., TALAMO S., TURNEY C. S. M., VAN DER PLICHT J. & WEYHENMEYER C. E. 2009 - IntCal09 and marine09 radiocarbon age calibration curves, 0-50,000 years cal BP, *Radiocarbon*, 51(4), p.1111-1150.

SCOLAN H., SANTOS F., TILLIER A.-M., MAUREILLE B. & QUINTARD A. 2011 - Des nouveaux vestiges néandertaliens à Las Pélénos (Monsempron-Libos, Lot-et-Garonne, France), *Bull. Mém. Soc. Anthropol. Paris*, 27 p.

STINER M. C., MUNRO N. D. & SUROVELL T. A. 2000 - The Tortoise and the Hare. Small-game use, the broad spectrum revolution, and Paleolithic demography, *Current Anthropology*, 41(1), p.39-73.

STINER M. C., MUNRO N. D., SUROVELL T. A., TCHERNOV E. & BAR-YOSEV O. 1999 - Paleolithic population growth pulses evidenced by small animal exploitation, *Science*, 283, p.190-194.

SUIRE C. 1969 - *Contribution à l'étude du genre Canis d'après des vestiges recueillis dans quelques gisements pléistocènes du Sud-Ouest de la France*. Bordeaux: Université de Bordeaux I, 2 vol., 179p., 213 tab., 4 graph., 68 fig.

SZMIDT C., LAROULANDIE V., DACHARY M., LANGLAIS M. & COSTAMAGNO S. 2009 - Harfang, renne et cerf : nouvelles dates 14C par SMA du Magdalénien supérieur du Bassin aquitain au Morin (Gironde) et Bourrouilla (Pyrénées-Atlantiques), *Bulletin de la Société Préhistorique française*, 106(3), p.583-587.

TCHERNOV E. & VALLA F. R. 1997 - Two new Dogs, and other Natufian Dogs, from the Southern Levant, *Journal of Archaeological Science*, 24, p.65-95.

TRUT L. N. 1999 - Early Canid domestication: the Farm-Fox Experiment, *American Scientist*, 87, p. 169.

- VAN KLINKEN G. J. 1999 - Bone collagen quality indicators for palaeodietary and radiocarbon measurements, *Journal of Archaeological Science*, 26, p.687-695.
- VIGNE J.-D. 2004 - *Les débuts de l'élevage*. Paris : Le Pommier ed, 186 p.
- VIGNE J.-D. 2005 - L'humérus de chien magdalénien de Erralla (Gipuzkoa, Espagne) et la domestication tardiglaciare du loup en Europe, *MUNIBE*, (Anthropologia-Arkeologia) 57 Homenaje a Jesus Altuna, p.279-287.
- VIGNE J.-D. 2011 - The origins of animal domestication and husbandry: A major change in the history of humanity and the biosphere, *C. R. Biologies*, p.11.
- VON DEN DRIESCH A. 1976 - *A guide to the measurement of animal bones from archeological sites*. Harvard University ed. Peabody Museum, Bull. 1.

ABSTRACTS

We present in this paper new remains and direct radiocarbon dates of small canids from Le Morin rock shelter (Gironde, France) which constitute a major discovery with respect to the question of wolf domestication during the European Palaeolithic.

In this study a multi-proxy approach has been employed, including species identification and a consideration of the archaeological and chronological context. The canids' remains have all been studied regarding their morphology, biometry and surface attributes. All dental and postcranial remains of canids were attributed to a species by using a thorough biometric database built from fossil and modern data from Europe. The morphometry of seven remains is outside the size range variability of wolves and therefore can be securely attributed to dog (*Canis familiaris*). Nineteen are attributed to wolf (*Canis lupus*) and six could not be securely attributed to one sub-species or the other (*Canis sp.*). More than 50 % of these *Canis* remains bear anthropogenic marks that demonstrate the utilization of both wolves and dogs by late glacial human groups. Two of the dog remains from Le Morin rock shelter were directly dated and indicate that Magdalenian groups lived with dogs. A discussion is therefore developed in this article regarding the development of this domestication through time and space.

INDEX

Keywords: domestication, late glacial, dog, wolf, *Canis lupus*, *Canis familiaris*, Magdalenian, Morin

AUTHORS

MYRIAM BOUDADI-MALIGNE

PACEA UMR 5199 CNRS, Université de Bordeaux, avenue des facultés, 33405 Talence cedex, France, m.boudadimaligne@gmail.com

JEAN-BAPTISTE MALLYE

PACEA UMR 5199 CNRS, Université de Bordeaux, avenue des facultés, 33405 Talence cedex, France, jb.mallye@pacea.u-bordeaux1.fr

MATHIEU LANGLAIS

PACEA UMR 5199 CNRS, Université de Bordeaux, avenue des facultés, 33405 Talence cedex,
France, m.langlais@pacea.u-bordeaux1.fr

CAROLYN BARSHAY-SZMIDT

University of Pennsylvania Museum of Archaeology and Anthropology, 3260 South Street,
Philadelphia, PA 19104-6324 USA
Archaeology Centre, University of Toronto, 19 Russell Street, Toronto, Ontario, M5S 2S2, Canada -
c.szmidt@utoronto.ca