



Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Traces of human and animal activity (TrAcs) in Cussac Cave (Le Buisson-de-Cadouin, Dordogne, France): Preliminary results and perspectives

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ARTICLE INFO

Article history:

Available online xxx

Keywords:

Ichnology
Cave art
Upper Paleolithic
Preservation
Traces
Subterranean context

ABSTRACT

Cussac Cave is well-known for its spectacular engraved art and well-preserved human remains attributed to the Gravettian period of the Upper Paleolithic, but it also contains many lesser-known remains and traces of human and animal presence throughout the site. Since 2009, a team incorporated in the *Projet Collectif de Recherche "Grotte de Cussac"*, directed by J. Jaubert, has been engaged in the identification, inventory and study of these "Activity Traces" (TrAcs). The objective is to study the interactions of humans and animals with this subterranean environment and to understand how humans perceived this complex space. Our aim is to confront the data associated with these TrAcs with the information provided by other disciplines. This approach is made possible by the conditions of the discovery of the cave, which was left almost untouched since the Paleolithic, and the strict policy of conservation that has been implemented. The team explores the cave in a non-invasive manner, respecting the limits of a designated pathway while recording, describing, and photographing the accessible TrAcs. The areas that are currently inventoried show that human TrAcs are more frequent and diverse than those of animals, and consist mostly of prints, tracked surfaces and black and red marks. Most of the animal TrAcs were produced by bears, and consist mainly of claw marks covering large areas. These bear marks always predate the human activities. The presence of TrAcs, art and human remains shows that this entire subterranean environment was intensively frequented by both humans and bears. Our approach constitutes a fundamental step towards an understanding of the cave, and more generally, of the identity and culture of Gravettian groups, reflected here in their behavior, activities and occupations in the context of this complex site with monumental engravings and human remains.

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1. Introduction

Caves are an ideal environment for the preservation of diverse traces of human and animal activities. The human frequentation of caves during the Paleolithic is represented by numerous types of traces, such as parietal art (Ontañón and Utrilla, 2015; Fritz et al., 2016; Robert, 2016), prints (Pastoors et al., 2016), artifacts, bones

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(Fontes et al., 2015; Straus et al., 2015; Corchón et al., 2016), charcoal deposits (Medina et al., 2010, 2012) and color marks (Lorblanchet, 2010; Arias et al., 2011a), which have provided evidences for the reconstruction of prehistoric lifeways. However, these manifestation are seldom brought together with the aim of contributing to a better understanding of Paleolithic human use, perception and interaction with the subterranean environment, the intensity of their frequentation of caves, or their relationships with other cave-dwelling species, such as bears. Preservation issues and the destruction of traces during site discovery and research can explain why this important evidence is sometimes neglected. Today, well preserved caves such as Cussac (Jaubert et al., 2012, 2016; Aujoulat et al., 2013; Jaubert, 2015; Ferrier et al., 2016), Chauvet-Pont d'Arc (Geneste et al., 2005; Le Guillou, 2005), Fontanet (Vialou, 1986), Bruniquel (Rouzaud, 1997), Tuc d'Audoubert (Bégouën et al., 2007, 2009), Les Trois Frères (Bégouën et al., 2014), Bédeilhac (Sauvet, 2007) and La Garma (Ontañón, 2003; Arias et al., 2011a, 2011b) contain numerous well-preserved traces that merit identification and comprehensive study. Fortunately, in recent years several decorated caves, such as Chauvet-Pont d'Arc, Cussac, Le Tuc d'Audoubert and La Garma, have been the subject of multidisciplinary studies considering all human and other animal evidence (Geneste et al., 2005; Bégouën et al., 2009; Arias et al., 2011b; Jaubert et al., 2012). In a similar manner, Pastoors and Weniger (2011) analyzed the spatial organization of activity traces in the French caves of Bédeilhac, Fontanet and Le Portel. These studies are in line with the "paleospeleology" approach defined by Rouzaud (1978, 1996, 1997) as a global approach to all human and animal remains and traces found in deep caves, with the aim of detecting, inventorying, protecting and studying this evidence *in situ*. Unfortunately, a major deterrent to this kind of investigation is the accessibility of these traces and their preservation. The main objective of this paper is to present the approach we have developed for the study of Cussac Cave with the aim of detecting, recording and protecting the well-preserved human and animal activity traces in this major Paleolithic decorated and sepulchral site.

2. Cussac Cave

Cussac Cave, located in Le Buisson-de-Cadouin (Dordogne, France), was discovered in 2000 by the speleologist Marc Delluc. It enters into a Campanian limestone cliff on the right bank of the Bélingou, a tributary of the left bank of the Dordogne River, and extends along some 1.6 kms in a single sub-horizontal gallery (Figs. 1 and 2). The present entrance is nearly half-way along the passage, making access possible in either the upstream or downstream direction of the subterranean river. During the first years of research, a pathway was marked throughout the cave, following the one taken by Marc Delluc when he discovered the cave. The aim of maintaining this single pathway is to ensure an optimum preservation of the cave floors and walls. This particularly well-preserved cave is characterized by parietal engravings associated with human remains deposited in bear hibernation nests, as well as animal and human activity traces (TrAcs) (Aujoulat et al., 2001, 2002; Fourment et al., 2012).

The human occupation of Cussac Cave has been attributed to the Gravettian period (Aujoulat et al., 2001; Jaubert et al., 2016), in part based on the art, which displays characteristic conventions typical of the Middle Gravettian style and similar to the parietal art in the Quercy (Pech Merle, Cognac, Roucadour) and Pyrenees (Gargas regions (Barrière, 1976; Jaubert, 2008; Lorblanchet, 2010; Aujoulat et al., 2013). This relative dating is coherent with the age of a human bone sample dated to $25,120 \pm 120$ BP (Beta analytic laboratory, Miami) or 29,500–28,835 calBP (OxCal 4.2 © Christopher

Bronk Ramsey 2014; IntCal 13, Reimer et al., 2013), as well as the age of the last charcoal sample collected and dated to $25,150 \pm 210$ BP (GifA 13150) or 29,704–28,714 calBP (OxCal 4.2 © Christopher Bronk Ramsey 2014; IntCal 13, Reimer et al., 2013) (Jaubert et al., 2016).

Since 2008, a multidisciplinary team has been studying the cave in the framework of a "Projet Collectif de Recherche" (PCR), directed by J. Jaubert, in order to obtain global understanding of the site (Jaubert and Feruglio, 2013; Aujoulat et al., 2013; Jaubert, 2015).

Since 2009, a team incorporated in the PCR has been involved in the identification, inventory and study of the human and animal Activity Traces (TrAcs). The objective is to study the interactions of humans and animals with the subterranean environment and to understand how humans perceived this complex space. This is achieved by conducting a systematic survey and confronting the data related to activity traces with information generated by other disciplines (parietal art, biological anthropology, karstology, geo-archaeology, ichnology, pigment analysis, topography, lithic and bone industries, zooarchaeology, etc.). In this sense, our approach is very similar to the "paleospeleology" approach (Rouzaud, 1996, 1997). Survey and inventory have already been conducted in some decorated caves such as Chauvet or Le Tuc d'Audoubert (Le Guillou, 2005; Bégouën et al., 2007, 2009). However, it seems that none of them have yet benefited from such global and exhaustive survey, conducted by a specific team. This meticulous approach is made possible by the stability of the cave environment, which is conducive to the preservation of activity traces especially archaeological remains, along with the conditions of the discovery of the cave, which remained almost untouched from the Paleolithic until its recent discovery, and even after, in compliance with a strict conservation policy.

The method presented here mostly concerns the ongoing inventory of the human and animal activity traces found in the cave. At Cussac, very little analysis has thus far been performed and concerns specific fields such as lithic and bone industries. However, the rarity of this type of evidence does not allow to discuss the use of the cave. The survey and inventory of the activity traces are therefore a fundamental phase in general understanding of the cave and its different areas. The observations made during the inventory enable us to suggest some hypotheses about the species which visited the cave, their use and perception of the subterranean environment, their behavior. The relative chronology of the different occupations and sedimentary events of the cave may also be determined from the localization and taphonomy of some TrAcs.

3. Methods

3.1. Inventory

As mentioned above, a global approach, taking into account all human and animal activity traces (TrAcs) found in the cave was favored. The systematic survey is conducted from upstream to downstream in a non-invasive manner, respecting the limits of the designated pathway and topography of the cave while recording, describing, and photographing the accessible TrAcs. Almost all of the observations were therefore made from the position of the discovery pathway. The studied areas are thus sometimes located several meters from the viewpoint. Good lighting with varied colorimetry, intensity, position parameters and binoculars are essential tools to optimizing our observations.

Two scales of observation were applied: general observation of the large areas, and more meticulous observation of individual traces or groups of them. Close attention was also paid during the return trip, from downstream to upstream, in order to be as exhaustive as possible in our observations. The TrAcs discovered

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