Journal of Archaeological Science 52 (2014) 524–534

Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: http://www.elsevier.com/locate/jas

Chronology of the Middle Palaeolithic open-air site of Combe Brune 2 (Dordogne, France): a multi luminescence dating approach

Marine Frouin [a, *], Christelle Lahaye [a], Marion Hernandez [a], Norbert Mercier [a], Pierre Guibert [a], Michel Brenet [b, c], Milagros Folgado-Lopez [b, c], Pascal Bertran [c, d]

[a] Institut de Recherche sur les Archéomatériaux – Centre de Recherche en Physique Appliquée à l'Archéologie (IRAMAT-CRP2A, UMR 5060), Université Bordeaux – Montaigne – CNRS, 33607 Pessac cedex, France
[b] INRAP, Pôle mixte de recherche, domaine de Campagne, 24260 Campagne, France
[c] PACEA, UMR 5199 Université Bordeaux 1 – CNRS, bâtiment B18, 33405 Talence cedex, France
[d] INRAP, Centre d'activité les Échoppes, 156 avenue Jean Jaurès, F-33600 Pessac, France

ARTICLE INFO

Article history:
Received 7 January 2014
Received in revised form
11 September 2014
Accepted 15 September 2014
Available online 22 September 2014

Keywords:
OSL
IRSL
Post-IRSL
TL
Dating
Early Middle Palaeolithic
Open-air site

ABSTRACT

The Bergerac region of south-western France is well known for its wealth of Middle Palaeolithic open-air sites. However, their chronology remains poorly understood due to the complexity of the deposits and difficulties applying radiometric dating techniques. Combe Brune 2, excavated in 2006 and 2007 by the INRAP (*Institut National de Recherches Archéologiques Préventives*), comprises a substantial stratigraphic sequence providing an almost continuous sedimentary record that is unique for the region. Three lithic assemblages were documented in the eastern part of the site and six stratified assemblages in the western part, five of which are concentrated in Unit 7. All the clearly individualised industries portray an unequivocal techno-economic coherence and are dominated by Levallois debitage.

Minerals present in the sediments were dated by the Optically Stimulated Luminescence (OSL) using different protocols (Thermal–Transfer: TT-OSL for quartz grains and IRSL and post-IR IRSL for feldspar grains). Heated flints were also dated by thermoluminescence (TL). Dating results obtained from quartz and feldspars grains provide an age of 234 ± 25 ka for Unit 8 at the base of the western sequence, 161 ± 18 to 97.3 ± 12 ka for Unit 7; 63.1 ± 6.5 ka for Unit 4 and a series of ages ranging from 39.2 ± 4.0 to 22.3 ± 2.2 ka for Unit 3. TL ages obtained from heated flints recovered from the base of Unit 7 in the eastern section range from 183 ± 20 to 195 ± 16 ka. These results are in good agreement and are stratigraphically coherent, suggesting that the Early Middle Palaeolithic occupation, the first documented for the Bergerac region, can be placed at the end of Marine Isotopic Stage (MIS) 7 and the beginning of MIS 6.

1. Introduction

Neanderthal lithic production concepts, methods and techniques portray substantial diversity from the beginning of the penultimate interglacial (MIS) 7) in south-western France. The archaeological record of the Bergerac area in the Dordogne region, and more precisely the Pécharmant limestone plateau, has produced a large number of Lower and Middle Palaeolithic sites (Brenet, 2011; Brenet et al., 2014). These occupations found in the same lithic raw material provisioning territory, all share particular economic and behavioural characteristics both in terms of production systems (debitage and *façonnage*) and associated tools.

Despite available lithostratigraphic and archaeostratigraphic data, it nevertheless remains difficult to discern the changing nature and function of these sites. This is particularly true of Middle Palaeolithic open-air given both their rarity and the fact that they are often less well-preserved in comparison to rock-shelters or cave sites. The open-air site of Combe Brune 2 differs from contemporary sites by 1) a thick, well-preserved sedimentary sequence permitting each lithic assemblage to be clearly individualised; 2) the presence of very diverse lithic artefacts, which provide insights for the *in situ* exploitation of local flint, including blank production

* Corresponding author. +33 6 29 59 98 33.
E-mail addresses: marine.frouin@u-bordeaux-montaigne.fr, marine.frouin@u-bordeaux3.fr (M. Frouin).

http://dx.doi.org/10.1016/j.jas.2014.09.012
0305-4403/

and/or transformation as well as the export of cores and blanks; and 3) the presence of heated lithic material.

Here we present dating results obtained from a combination of luminescence methods employing various materials (heated flint, quartz and feldspar grains). This new chronological framework makes possible a comparison of site-scale palaeoenvironmental data against regional palaeoclimatic patterns. Similarly, the chronological position of the Combe Brune 2 lithic assemblages is discussed with reference to other Early Middle Palaeolithic sites in the Bergerac area.

2. Combe Brune 2

The open-air site of Combe Brune 2, discovered during road works close to Bergerac (Fig. 1), lies on the edge of the Pécharmant limestone plateau, a few dozen metres south of Combe Brune 3 (Brenet, 2011). Following initial trench test pits in 2003, which produced evidence for several Middle Palaeolithic levels (Bourguignon et al., 2004), the site was excavated by an INRAP team directed by M. Brenet and M. Folgado between October 2006 and February 2007.

2.1. Morpho-geological context

Combe Brune 2 is located on a heavily karstified Cretaceous limestone plateau covered by flint-clays and discontinuous Tertiary alluvial sands and gravels. Two approximately 700 square metre areas were excavated. In the southeastern part of the site, the stratigraphy is compressed, with the archaeological level resting on a clast-supported gravel layer at the top of the flint–clay deposits (supplementary data S1). This layer, overlain by 0.6 m of loessic material, is interpreted as a Pleistocene coarse-grained lag deposit connected to the long-term alteration of the gravely clay. The undulating topography of the coarse-grained lag deposit documented during excavations was scattered with small depressions resulting from karstic subsidence. The western part of the site comprises two coalescent dolines infilled predominately with fine-grained colluvial sediments, which derive from the reworking of loessic material, together with local Tertiary sands and clayey weathering products (Fig. 2).

The stratigraphy of doline 2, from which most of the artefacts were recovered, is composed of nine units (from top to bottom):

- Unit 1 – Dark brown sandy silts, 35 cm thick (horizon *A*, plowsoil).
- Unit 2 – Dark yellow-brown clayey silts, 0–50 cm thick (horizon *Bw* in Holocene colluvium).
- Unit 3 – Light yellow-brown sandy silts, with Fe–Mn mottles and a sub-angular blocky structure, 0–35 cm thick (horizon *Eg*).
- Unit 4 – Brown-yellow (10 YR) compact clayey silts with Fe–Mn mottles, 60–120 cm thick (glossic horizon *Bt*). Units 3 and 4 correspond to a Holocene luvisol in loessic colluvium.
- Unit 5 – Brown-yellow sandy silts with scattered small gravels and a sub-angular blocky structure, 0–20 cm thick. Rounded Fe–Mn concretions are abundant (horizon *Bir*).
- Unit 6 – Bright brown (7.5 YR) clayey silts with a platy structure, 60 cm (horizon *IIBt* in a Pleistocene luvisol containing with loessic colluvium).
- Unit 7 – Heavily mottled, sandy silts with a prismatic structure, 50 cm (gleyic horizon *IIBg*). The main artefact-bearing horizon was found in this unit.
- Unit 8 – Red-brown (5 YR) sandy clays with a prismatic structure (*IIIBt* horizon of a Pleistocene luvisol).
- Unit 9 – Sandy gravel with a red, clayey matrix and a few sandstone blocks (colluviated Tertiary alluvium).

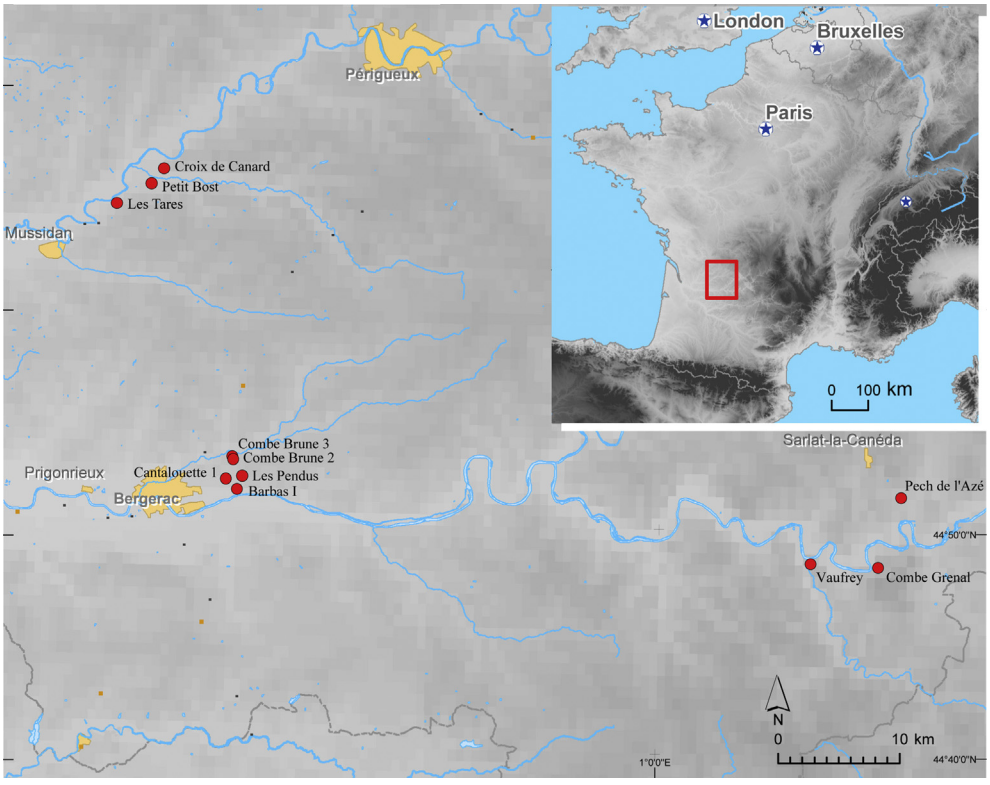

Fig. 1. Location of Combe Brune 2 and Early Middle Palaeolithic sites mentioned in the text.