Quaternary International xxx (2016) 1–24

Contents lists available at ScienceDirect

Quaternary International

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

Acheulean in Monaco: Observatoire cave and its singular occupations

Elena Rossoni-Notter [a, *], Olivier Notter [a, b], Suzanne Simone [a], Patrick Simon [a]

[a] Musée d'Anthropologie préhistorique de Monaco, 56 bis boulevard du Jardin Exotique, 98 000, Monaco
[b] UMR 7194, Muséum National d'Histoire Naturelle, Département de Préhistoire, 1, Rue René Panhard, 75013, Paris, France

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Lower Paleolithic
Monaco- Acheulean
Handaxe–large flake tools
Hammerstones

ABSTRACT

The Observatoire cave is located in the western end of the Principality of Monaco. Excavated very early – in 1916 – due to an event of an unexpected discovery, its lower unit, divided from c to k, delivered numerous assemblages including in particular handaxes, and more surprising, series of limestone large flakes and spherical pebbles. In the 1980's, new surveys were conducted and achieved a new layer (l) dated from 350 to 400ka (MIS 11-10). U–Th methods also gave two other dates within the stratigraphy: >178ka (>MIS 6) for stalagmitic floor II and >230ka (>MIS 7) for stalagmitic floor III. The oldest evidence of human occupations in Monaco – never studied in its integrality – deserved further and complete analysis of its successive assemblages. This work, based upon the use of unpublished archival data and a complete inventory and relocation of the pieces, provides precious and new information on the former "Old Paleolithic" filling. Petrographical, technotypological and morphofunctional analysis allowed highlighting the successive technoeconomic features. The correlation between the updated study of the industries coming from the old excavations and the unpublished results of the modern ones confirm the presence of a singular component (i–k units and l layer), out of the regional Paleolithic panorama. The lowest toolmakers selected subovoid and fist sized peripheral limestone pebbles, rarely andesitic, obviously for different *in situ* activities. They also shaped more voluminous and semi-local (?) limestone pebbles from which they imported standardized large flakes ($\approx 100 \times 100$ mm) mostly used for their convex-cutting edge (cleaver). This specific and functional duo includes handaxes (k unit), pebble tools (l layer) and other products from few elaborated debitage made of semi-local (Ciotti) and allochtonous (Esterel, north of Var) siliceous materials. Consequently, it is considered within the Liguro-Provençal Acheulean panorama. The more recent knappers d–e–f-h1 left fewer traces (due to the function of their occupations?). They also rather favored the north peripheral (Ex-Vita) and ligurian (San Remo/Bordighera) areas while they employed more complex methods of debitage (Levallois recurrent unipolar, Levallois recurrent unipolar convergent, Levallois recurrent centripetal, unifacial/bifacial Discoid). In parallel of these productions (flakes, points and blades), shaping activities remained with the presence of two bifacial pieces (e unit) considered as support of tools, in contrast with the inferior bevel handaxe (k).

1. Introduction

The Observatoire (Monaco) cave is situated on the Liguro-Provençal corridor, which is landlocked between mountain and sea. This site is part of a refuge area along the Riviera that – on several occasions – has given evidence of old occupations (Fig. 1) since about 1 ma (Yokoyama et al., 1988): Vallonnet cave (Roquebrune-Cap-Martin, France) (Lumley, 1976; Echassoux, 1998; Cauche, 2009), Vallon Obscure (Saint-Isidore, France) (Cauche et al., 2014), Terra Amata (Nice, France) (Lumley de, 1969, 1976; Lumley de et al., 1976, 2009a, 2009b, 2015), Lazaret cave (Nice, France) (Lumley de, 1969, 1976; Lumley de and Barsky, 2004; Cauche, 2012; Lumley de et al. 2015), Fate cave (Savona, Finale Liguria, Italy) (Isetti and Lumley de, 1962; Lumley de, 1969; Vicino, 1976) and Carros-le-neuf (Carros, France) (Morel, 1972; Texier, 1972; Goudet, 1975; Lumley de et al., 2008).

Between 1916 and 1987, the successive teams of the Museum of Prehistoric Anthropology of Monaco unearthed the fillings of Observatoire cave, which revealed several assemblages attributed to Lower Paleolithic: d–e–f–g–h–i–k units and l layer. Even biased by old excavations (Observatoire, d–e–f–h–i–k units),

* Corresponding author.
E-mail addresses: elenarosso@hotmail.fr, erossoni-notter@gouv.mc (E. Rossoni-Notter), notterolivier@hotmail.com (O. Notter), suzanne_simone@libello.com (S. Simone), patrick.simon@map-mc.com (P. Simon).

http://dx.doi.org/10.1016/j.quaint.2016.01.073
1040-6182/

Fig. 1. Location map of Observatoire cave (Monaco) and Lower Paleolithic sites in Liguro-Provencal area (after B. Magnaldi in Lumley de et al., 2011).

former publications (Boule and Villeneuve, 1927; Simone, 1980, 1993; Porraz et al. 2014) showed that Observatoire delivers important information on Acheulean technical behaviors. For instance, it offered original collections with at its base numerous large flakes and pebbles, confirmed by new excavations undertaken in the 1980s. In addition, some units also contained handaxes and Levallois productions. Actually, three dates achieved with U–Th methods on stalagmitic floors (>178ka and >230ka) and microfauna identification (>350ka) (Viriot et al., 1991; Simone, 1993) allowed dividing this lowest filling called the *Fosse* (Boule and Villeneuve, 1927) into 3 different chronocontexts. Based on current knowledge, Observatoire cave gave the oldest evidence of occupations in Monaco.

To date, the lithic collections were not studied in their integrality. Their re-examination and re-interpretation appeared more than appropriate to better understand this site, its successive occupations and the behavior of its toolmakers. This work – through the analysis of unpublished documents and a first exhaustive technotypological assessment of the material – aimed to provide detailed and checked data, for both old and modern excavations. This correlation will in particular serve the analysis of the specific products discovered in the lowest units, which raise many technical and functional questions. What are their main operational sequences and aims of use? Does the new excavation bring to light new data on that matter? Are these components original? The respective technical behaviors and their modifications had been characterized through petroarcheological and technotypological studies. Morphofunctionality analysis (Boëda, 2001) was applied in particular to the tools and large flakes. We therefore attempted defining and delimiting technical units. It provided some significant results as the minimum raw material circulations of the knappers, the identification of their respective methods (*e.g.* modalities of Levallois productions) and technics. Where/when do the technological rupture(s) occur? The outcomes and interpretations resulting from this recent study were embedded as possible within the Lower Paleolithic panorama of the Liguro-Provençal area and the South of France, but the uniqueness of some assemblages led us to turn towards wider comparisons.

1.1. Geography, geology, history overviews

Observatoire cave is located in the western part of the Principality of Monaco (Fig. 1), and more precisely in the heart of its Exotic Garden (latitude and longitude coordinates 43°43′51.90″N – 7°24′50.02″E). This intensively fractured zone belongs to an Upper Jurassic and dolomitized cliff locally called *lou Baoussou* (*i.e.* the Rock) (Boule and Villeneuve, 1927), at the foot of the promontory of the *Tête de Chien* (Turbie, France) of 550 m high (Gilli, 1999b). These plausible Kimmeridgian limestones of Secondary marine origin (Barral, 1950) are part of the subalpine chains and Arc de Nice formation and include Upper Cretaceous marly limestones and Cenomanian marls (Gilli, 1999a, 1999b) (Fig. 2).

Continually formed by tectonic activities, the cave opens to the south, at an elevation of 103.06 m above sea level (Fig. 3) with a fault that strikes northeast southwest and dips to southwest (Fig. 2). The dimensions at its entrance are approximately 17 m in length, 6 m in width and over 7.50 m high; a nearby water source was easily reachable (Boule and Villeneuve, 1927).

Named after a former astronomical construction, built by Dr. Alfrène Gueirard (1884–1895) in 1889 (Fouilleron and Carpine-Lancre, 2010; Correspondences, examples of 26 may 1890 and 4 may 1896, Prince's Palace of Monaco Archives) and destroyed between 1914 and 1916 (?). Observatoire cave was formerly named *Baoussou* cave (Boule and Villeneuve, 1927), and before that, registered as *Baus de Cafio* (*in* Rosticher Giordano et al., 2013). Topographically known, it was long considered as an archeological matter of concern, « *À plusieurs reprises, le Prince m'avait envoyé visiter la grotte du Baoussou. L'expérience que lui donnait la pratique des fouilles préhistoriques la lui faisait juger bonne* (Boule and Villeneuve, 1927) », but planned excavations were difficult to

Please cite this article in press as: Rossoni-Notter, E., et al., Acheulean in Monaco: Observatoire cave and its singular occupations, Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2016.01.073