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## Acheulean breccias of Prince cave (Liguria, Italy): New insights and regional issues

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### ABSTRACT

Prince cave is located along the Liguro-provençal corridor, in Italy (Liguria). Between mountains and sea, in the heart of a refuge zone, this site is part of the Paleolithic complex of sites called Balzi Rossi or Grimaldi. The excavations led from 1966 to 2002 managed to unearth Acheulean industries in two distinct brecciated deposits. Former interdisciplinary studies and analysis attributed Br2 to MIS 7 ( $220,000 \pm 120/50$  ka) and Br1 to MIS 6. With the aim to update the characterizations and the place of these assemblages within the regional Acheulean panorama, this work conducts for the first time an exhaustive study on the respective industries. It provides detailed data on their numerical distributions, territorial patterns, technical features, and technoeconomic strategies. The results leads undoubtedly to common behaviors but modulated by significant differences. Both groups were looking for available littoral pebbles as to shape heavy and large cutting tools, in particular in Br1 ( $n = 159$ ) where they are better and wider represented (choppers, chopping-tools, handaxes, picks, unifacial, rostro-carinate, épannelé). Br2 ( $n = 290$ ), richer in artefacts, delivers much fewer products among which larger choppers, chopping-tools and bifacial piece. In both cases, direct percussion with hard hammers is prevalent, but bipolar percussion and soft hammer (Br1) had also been employed in finalization phases. Furthermore, the corpuses always include large flakes coming from specific operating sequences of debitage. Local Ciotti flints and other semi-local hard siliceous materials (Perinaldo flints, microquartzite), collected on the ligurian littoral at 10–20 km to the east, were used for medium flakes productions and the confection of retouched tools. Western (15–20 km) and allochthonous (>30 km) procurements appear exclusive to Br2. However, Prince knappers shared the same techniques (direct percussion with hard hammers), methods (unifacial/bifacial Discoid, recurrent unipolar, bipolar, and centripetal Levallois, SSDA) and technoeconomic strategies (ramifications, recycling of isotropic materials, blanks, tools, *in situ* knapping and confections). Volumetric unipolar and orthogonal methods are only inventoried in Br2. Debitage schemes pursued the productions of unretouched elongated flakes and manufacturing of scrapers and denticulates. Br2 corpus revealed a better control and efficiency in this particular regard. Its operating sequences are longer, more complex and achieved. It offers also a more various toolkit (transversal scrapers, Clactonian and retouched notches, beaks, points, Tayac point, awls, end-scrapers). With a lower “pre-Mousterian” industry and a upper “final Acheulean”, Prince industries complete and inform the Acheulean neighboring complex.

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### 1. Introduction

Prince cave is located within Balzi Rossi complex of Paleolithic sites, on the border between Menton (Southeast France) and

Ventimiglia (Liguria, Italy). Excavated since the 20th century, it delivered Mousterian components that revealed numerous and successive occupations from MIS 5 to MIS 3 (Rossoni-Notter, 2011; Rossoni-Notter and Simon, 2016a,b). Its Acheulean layers were discovered much later, in 1966, through the survey of two posterior eastern breccia deposits named Br1 and Br2 (Barral and Simone, 1965, 1967, 1968, 1971, 1976, 1984 and 1985; Simone, 1970, 1997). The lithic industry unearthed in the lowest breccia (Br2) was characterized as an “old Tayacian based on a limited raw material procurement” (Simone, 2008). Moreover, a preneandertalian iliac

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bone (Barral and Simone, 1967 et 1987; Lumley de, 1972a,b) associated to this assemblage was dated to  $220,000 \pm 120/50$  ka (Barral and Simone, 1987; Yokoyama, 1989). The upper breccia (Br1) offered less material, typical of the Upper Acheulean technocomplex (Simone, 1970, 1980 and 2008).

Our recent study focuses on the lithic assemblages that represent an important resource for the understanding of Mediterranean Acheulean technical behaviors and evolution, in particular in southeast France and the Liguro-provençal area (Fig. 1). Are these industries so different throughout the raw materials territories and technoeconomic strategies? Did these groups share the same methods and technics of knapping? What about their processes and objectives of productions? The technological data previously recorded had to be updated and completed, especially in light of the new regional results. With the aim to define the technical features in Prince cave according to technological and morphofunctional analyses and replace them into the Acheulean neighboring framework, both assemblages were utterly and exhaustively reviewed.

### 1.1. Brief overviews and considerations about Prince cave

Prince cave is located on the Italian territory, between Menton (southeast France) and Ventimiglia (Liguria, Italy). It is part of the worldwide known Balzi Rossi complex of sites (Grimaldi) where not less than twelve Paleolithic sites were inventoried (Fig. 2): seven caves (Costantini, Enfants, Florestan, Cavillon, Barma Grande, Baouso da Torre, Prince), three shelters (Lorenzi, Mochi, Bombrini) and two open-air sites (Ex-Birreria, Ex-Casino). Prince is the most eastern and largest cave, as it measures 34 m long and 9 m wide, with an entrance of 16 m (Villeneuve et al., 1906–1912). Oriented southeast-northeast through an inherent fault of the upper Jurassic limestone, the site opens to south at 8.30 m asl within the reddened steep cliff (Fig. 3) that gave its name to the complex.

In March 1892, Prince cave was bought by Prince Albert 1st from Emile Rivière, and changed its traditional name of *Pont Romain* (Correspondence, M. Capello, 12 March 1893, C801, Prince's Palace of Monaco Archives; Correspondence, Villeneuve to Prince Albert 1st, 28 November 1903, C801, Prince's Palace of Monaco Archives; Villeneuve et al., 1906–1912; Hurel, 2008). Not less than 4000 m<sup>3</sup> (Simone, 1970) or 21.60 m deep filling (Villeneuve's notes, 11 January 1902, C801, Prince's Palace of Monaco Archives) was excavated between April 26, 1895 and 1902 (Correspondence, Villeneuve to the Secretary of Authorities, 26 April 1895, C801, Prince's Palace of Monaco Archives). Leonce de Villeneuve and Federico Lorenzi discovered five Mousterian units based on Cenomanian marls of Upper Cretaceous on which a Marine Tyrrhenian deposit was formed (Villeneuve et al., 1906–1912; Blanc, 1955; Simone, 1970) and dated from MIS 5e. The Middle Paleolithic units divided from E to A (Villeneuve et al., 1906–1912). Further paleontological (Villeneuve et al., 1906–1912; Chaix and Desse, 1982, 1983 and 1991; Arellano-Moullé, 1997–1998; Arellano-Alonso, 2004; Arellano et al., 2009; Mousous, 2014) and technotypological studies (Villeneuve et al., 1906–1912; laworsky, 1961, 1962; Lumley-Woodyear, 1969; Vicino et al., 1976; Yamada, 1993; Rossoni-Notter, 2011; Rossoni-Notter and Simon, 2016a,b) detailed these successive occupations which extended from MIS 5 to MIS 3.

Villeneuve and Cartailhac, as well as other scholars, had already underlined the potentiality of oldest occupations in Prince cave (Villeneuve et al., 1906–1912; Blanc, 1955; laworsky, 1961; Bonifay MF, 1962; Bonifay, 1962; Lumley, 1963; Barral and Simone, 1967, 1976; Simone, 1970) but a confirmation had to wait almost sixty years. Louis Barral and Suzanne Simone from the Museum of Pre-historic Anthropology of Monaco conducted from 3 August 1966 to 2002 (Simone, 1970, 1997; Barral and Simone, 1976) three campaigns of excavations in 1966–1975, 1982–1988 and 1995–2002. The survey dedicated to a brecciated cross-section (Fig. 4) managed to give evidence of two distinct Acheulean occupations, named Br2



Fig. 1. Location map of Prince cave (Ventimiglia, Italy) and Lower Paleolithic sites in Liguro-Provençal area (after B. Magnaldi in Lumley et al., 2011).

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