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Evidence of an Early Pleistocene hominin presence at Pirro Nord (Apricena, Foggia, southern Italy): P13 site

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ABSTRACT

The Pirro 13 karst fissure (Cava dell'Erba, Apricena, Foggia, Italy) shows a significant vertebrate assemblage (Pirro Nord Faunal Unit) associated with lithic artifacts attributable to mode 1. The Faunal Unit, corresponding to the latest Villafranchian, is dated on biochronological basis between 1.3 and 1.6 Ma and accordingly the artifacts represent among the earliest evidence of human presence in Europe. The vertebrate assemblage includes many species of amphibians, reptiles, birds and mammals, and attests the earliest occurrence of many taxa in Italy such as *Bison degiulii*, *Capreolus* sp., *Equus altidens*, and *Meles meles*. The lithic assemblage is characterized by a high degree of opportunism and by the exclusive presence of debitage reduction sequences.

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1. Pirro 13 fissure

Pirro 13 fissure (Fig. 1) was excavated in 2007 and 2008 by an interdisciplinary team composed by researchers from the Universities of Ferrara, Torino and Roma "Sapienza". The karst fissure is located on the stratigraphic boundary between the Mesozoic limestone and the Pleistocene calcarenite (at the top). It is filled, to more than 4 m thickness, by sandy-clayey sediments alternating with large and small blocks of Pleistocenic calcarenite (Arzarello et al., 2009; Pavia et al., 2010, 2012). Filling is due to an initial mass fall phenomenon emplacing the large blocks of calcarenite, and subsequent fillings with clay-sandy sediments.

During the 2007 excavation, three surveys were made in order to verify the stratigraphic position of the lithic artifacts and their association with the paleontological record. During the second year of activity (2008), an extensive excavation was completed over 4 m^2 in the middle part of the karst deposit, and two stratigraphic units were excavated (Fig. 2). Units A and B (corresponding to α and β in the previous excavation) are characterized by a clay-sandy matrix with rare calcareous stones (A) and by a clay-sandy matrix containing many stones with sharp edges and no preferential orientation (B). In both units, sandy lenses are present. The excavations continued in July–August 2010 in the same area.

Both systematic excavations have shown that the recovered lithic artifacts are very homogeneous, from the technological point of view, all along the stratigraphic sequence. and that they seem to be the result of a synchronous event of accumulation. The systematic excavation has also confirmed the clear association between the Pirro Nord Faunal Unit vertebrate taxa and the lithic artifacts for all the levels in the karst fissure filling.

From a chronological point of view, in accordance with the paleontological data, Pirro 13 lithic artifacts represent one of the oldest occupations of Western Europe, dated between 1.3 and 1.6 Ma (Arzarello et al., 2007, 2009). Radiometric dating (U/Th ESR combined) is still in progress at the Dating Laboratory, Muséum National d'Histoire Naturelle. Paris.

2. Paleontological assemblage

The Pirro Nord vertebrate assemblage includes 20 species of amphibians and reptiles (Delfino and Bailon, 2000), 47 species of birds (Bedetti, 2003) and over 40 mammal species (Arzarello et al., 2009 and references therein; Pavia et al., 2012). Mammals are characterized by a large number of carnivores (Petrucci, 2008; Petrucci et al., in press), ungulates, the large porcupine *Hystrix refossa* (Rook and Sardella, 2005), and possibly the large sized gelada baboon (*Theropithecus* sp.) (Rook et al., 2004).

The Pirro Nord faunal assemblage has great biochronological value, with the earliest occurrence of many taxa in Italy such as *Bison degiulii*, *Capreolus* sp., *Equus altidens*, *Meles meles*. Among rodents, the occurrence of *Microtus* (*Allophaiomys*) *ruffoi* can be

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Fig. 1. A) position of Pirro 13 fissure inside Cava dell'Erba (Apricena (FG), Puglia, Southern Italy); B) site location: 1 – Pirro Nord site (Cave dell'Erba), 2 – Gargano promontory, 3 – Foggia; C) Pirro 13 fissure during 200 excavation; D) zoom on the upper layers stratigraphy in Pirro 13.

noted (Arzarello et al., 2009). Pirro Nord Faunal Unit (FU) corresponds to the latest Villafranchian Large Mammal Age (Gliozzi et al., 1997) and can be related to other European faunal assemblages such as Venta Micena (Spain) and Apollonia 1 (Greece) (Rook and Martínez-Navarro, 2010).

The Pirro Nord vertebrates have been collected in different karst filling deposits. Recently, detailed analysis have been carried on the fossils recorded from Pirro 13 (P13) and especially from Pirro 10 (P10) where the most complete sample of vertebrate fossils have been collected (Pavia et al., 2010, 2012). Both of the sites belong to

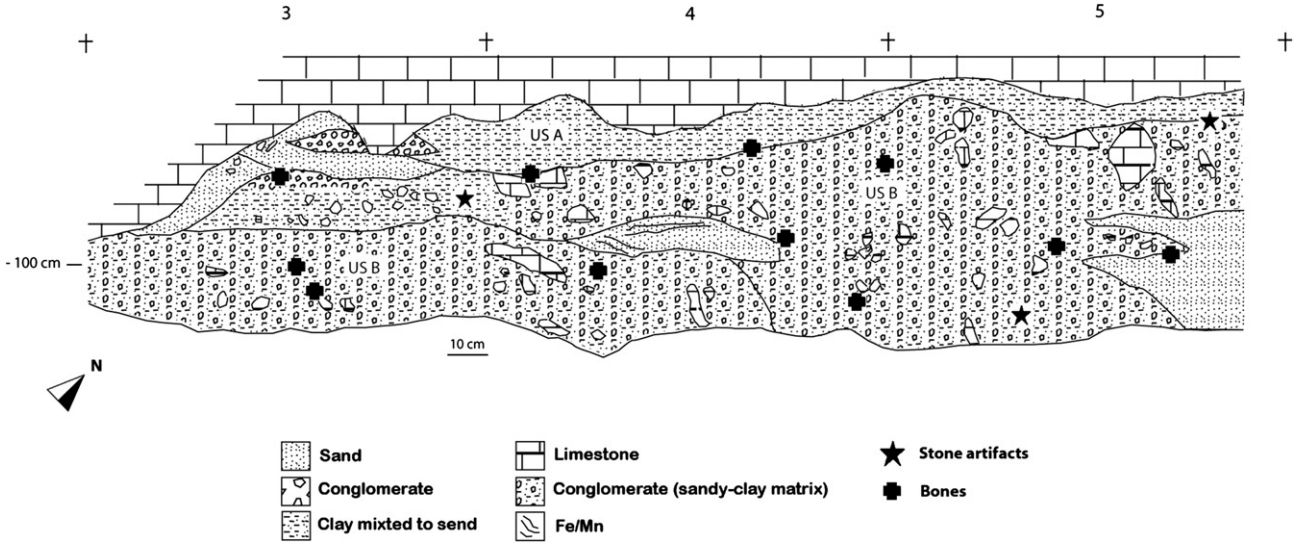

Fig. 2. Pirro 13, 2008 excavation: longitudinal section on the band A/B, squares B3, B4 and B5. Lithic artifacts, as faunal remains, were distributed without a preferential direction or inclination in all the stratigraphic units.

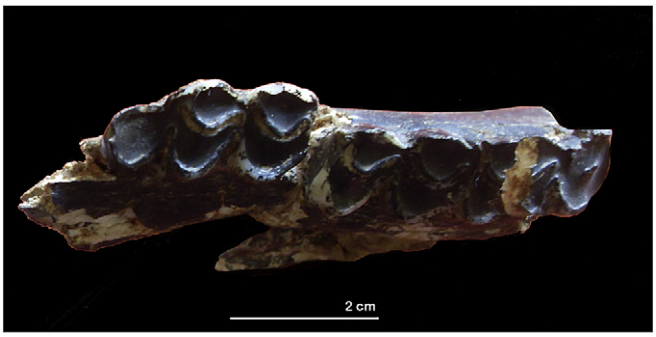

Fig. 3. Pirro 13, *Axis eurygonos* mandible, occlusal view (photo C. Bagnus).

a complex karst system whose continuity has been shown by geological surveys (Pavia et al., 2012).

P13 represents a sinkhole, where a large part of the fauna was transported inside the cave system together with very large blocks resulting from rock falls. The P13 filling is due to running waters that carried and deposited coarse gravels, much coarser than those in P10.

The field work on P13 was carried out in 2007 and 2008, although some fossils were discovered in preliminary field surveys in 2004 and 2005. The fossils include long, more or less fragmented bones, and isolated teeth. No articulated (even partially) bones have been recorded. In some cases, fossils are clearly displaced. Bones are characterized by dendritic to extensive Fe–Mn black coatings, as can be observed in fossils from P10. The analysis of the taphonomy for the vertebrate remains in this deposit is still in progress (Zunino et al., and Bagnus, both unpublished data).

From P13, the following materials have been collected:

- isolated teeth (well preserved) and bone fragments referable to *B. degiulii*, *Axis eurygonos* (Fig. 3), *Capreolus* sp. and *E. altidens*;
- part of jugal teeth of *Stephanorhinus* sp.;
- isolated teeth and bones of *M. meles*, *Pachycrocuta brevirostris*, *Homotherium latidens*; canids possibly *Canis mosbachensis*, *H. refossa*;
- fragments of a molar referable to a proboscidean.

After sieving the sediment, lagomorphs, rodents, insectivores, reptiles (turtles in particular) were also collected, together with cervid and proboscidean teeth fragments. In addition, shark teeth, echinoids, ostreids and pectinid shells (well preserved), and esacorals, all taphonomically reworked from the Early Pleistocene (Gelasian) encasing calcarenite of the Calcari a Briozoi Fm. (Pavia et al., 2010), have been detected.

The mammal bones frequency in P13 is lower than in P10, but the taxa represented in P13 suggest a complete analogue to the P10 assemblage. In some cases, the scantiness of the fossil record cannot support a more detailed systematic attribution.

Table 1
Number of flint lithic artifacts (flakes and cores) from the excavation (2007 and 2008). 28 other flakes were found in the reworked sediments near P13 fissure.

Stratigraphic unit	N° lithic industries
α + A	25
β + B	26
US C	1
γ	5
δ	6
ϵ	2
ζ	3
η	4
θ	14
ι	1
μ	1
Total	88

3. Technological characterization of the lithic assemblage

The Pirro 13 lithic assemblage is composed of a total of 116 artifacts, 88 from the excavation and a clear stratigraphic unit, and 28 from the reworked sediments near the P13 fissure (Table 1). All concentrations were observed in a specific stratigraphic unit and the lithic artifacts were always associated with the Pirro Nord typical fauna (De Giuli et al., 1987; Abbazzi et al., 1996; Arzarello et al., 2007, 2009; Pavia et al., 2008).

The only exploited raw material is flint from the Gargano Cretaceous successions. It was always collected in secondary positions (river beds), not more than 7 km from the Pirro 13 site. Three different types of flint were exploited, two brown and grey very good quality flints (without internal fractures), and a black flint with numerous fractures. The collected pebble dimensions range between 4 and 8 cm in diameter. The pebble sizes are the main factor that influences the débitage organization and the blanks morphology.

From a taphonomical point of view (Table 2), all the lithic artifacts show the same status of preservation. Most of the material (78%) is characterized by Fe–Mn coatings (the same features are evident also on the paleontological remains). Some flakes (9%), made on grey flint, show a white superficial patina. The edges are well preserved, even if it was not possible at the present state of research to recognize usewear traces (G. Berruti personal communication). No rounded edges are present. The lithic artifacts seem to have been reworked over a short distance. The

Table 2
Main technological characteristics of the Pirro Nord lithic assemblage. The effects are inherent in the materials found through 2008. During the excavation of 2010, 62 more products were found.

Cores	Opportunistic/unipolar débitage	Centripetal debitage	Core fragments				TOT.
	10	6	2				18
Flakes	Complete flakes	Fragmented flakes					
	71	27					
	Cortical flakes	non cortical flakes					98
	51	47					
	Centripetals scars	Unipolar scars	Bipolar scars	Crossed scars	Orthigonal scars	“Kombewa”	
	16	42	4	24	6	6	
						TOT.	116

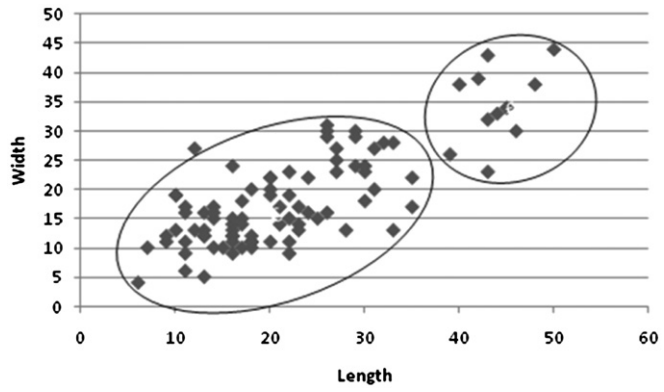

Fig. 4. Dimensional analysis of lithic artifacts from P13 excavation. Reworked materials and incomplete artifacts are not included. The two dimensional groups are related to the initial dimensions of collected raw material.

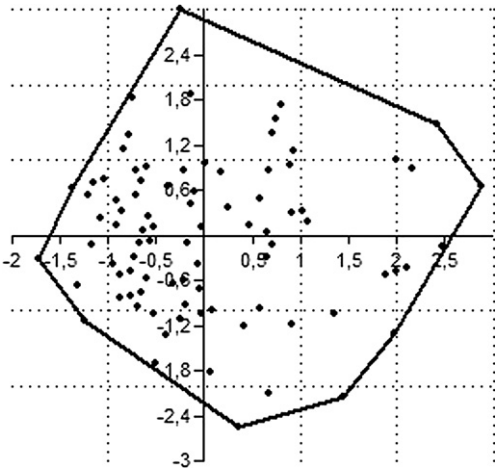

Fig. 5. More probable/frequent flakes from Pirro 13 fissure calculated using Principal Component Analysis.

characteristics indicate that the original position of the prehistoric site was not far from the actual discovery location.

All steps of the reduction sequence appear to be represented, even if the artifact number is too small to suppose that the reduction sequence is complete. Cortical flakes are plentiful and coherent with the exploitation methods, as *plain débitage* products. No refittings were found, as it is normal for material coming from a non-primary position.

3.1. Dimensional analysis

Artifact dimensions are variable, but they are always bigger than the small flint fragments/pebbles found in the sediments that do not result from anthropic activity. Two size groups are observable (Fig. 4), related to the dimensional characteristics of exploited raw material. Considering the length/width, the median value is 1.19; the minimum is 0.44 and the maximum is 2.6 (variance 0.10 and standard deviation 0.433). Generally, oriented flakes are slightly longer than wide, but numerous wider than long flakes are also attested, probably due to the significant use of centripetal débitage on small pebbles. The more common flakes from centripetal débitage are shown in Fig. 5.

Cores and flakes relative percentages are coherent because cores represent 7% and flakes 93% of the lithic assemblage. From a technological point of view, there is a strong relation between the knapping methods observed on flakes and cores.

3.2. Reduction sequences

Two main different reduction sequences are present in the Pirro Nord site (fissure 13): opportunistic/unipolar débitage (c.f. S.S.D.A.: Forestier, 1993) and centripetal débitage. They are all strictly related to the raw material morphology.

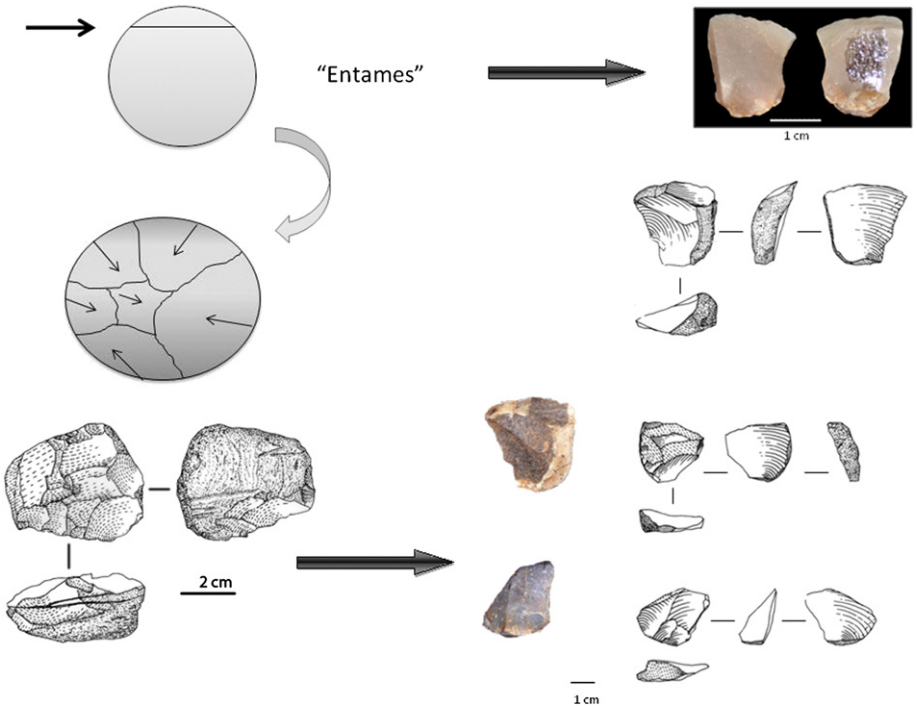

Fig. 6. Scheme of centripetal débitage made on small/medium size pebbles (Drawing: D. Aureli).

For the centripetal débitage (Fig. 6), small-medium pebbles were chosen. Their dimensions are between 3 and 5 cm diameter and they are generally spherical or sub-spherical. Pebbles were initiated with a bipolar débitage (this technique only is used in Pirro Nord for these) and the two resulting parts (one twice the size of the other) were exploited with a centripetal débitage. From the core flake, only a few "Kombewa flakes" were obtained with a quadrangular profile, while from the other part of raw material (with the concave surface) a more extended knapping sequence was applied. No preparation of striking platform was made, but sometimes an orthogonal (to the débitage surface) flake was detached and the negative was used as an initial striking platform to start the centripetal production. The débitage direction was centripetal or semi/centripetal (cordal), alternating lateral debordant with non-debordant flakes. The most common morphology of those products was triangular flakes with a natural debordant side. This reduction sequence step was always made by direct percussion with a hard hammer. Cores were always discarded before total exploitation, probably in relation to minimal product dimensions.

The opportunistic débitage, the rarest in the lithic assemblage, was usually used to exploit quadrangular pebbles (more in black flint with several tectonic fractures) and to exploit large pebbles (rare in raw material sites). In the first situation, one to three knapping surfaces and débitage surfaces were developed using a direct percussion technique (Fig. 7). The general scheme was: 1) exploitation of a first natural angle between 90° and 80° to obtain 2–4 flakes with no predetermined form; 2) utilization of the first débitage surface as a striking platform in order to obtain 2–4 flakes from a second débitage surface, orthogonal to the first one; 3) utilization of a third striking platform, either a natural surface or the second débitage surface. This third stage is not always present and normally allowed production of only one or two flakes. In this phase, cores were abandoned before total exploitation, and most products are completely cortical or have a lateral cortex.

Large pebbles were exploited using several striking platforms (from 4 to 6). Each débitage surface was employed to obtain 3 or 4 large flakes, using a unipolar or centripetal knapping direction

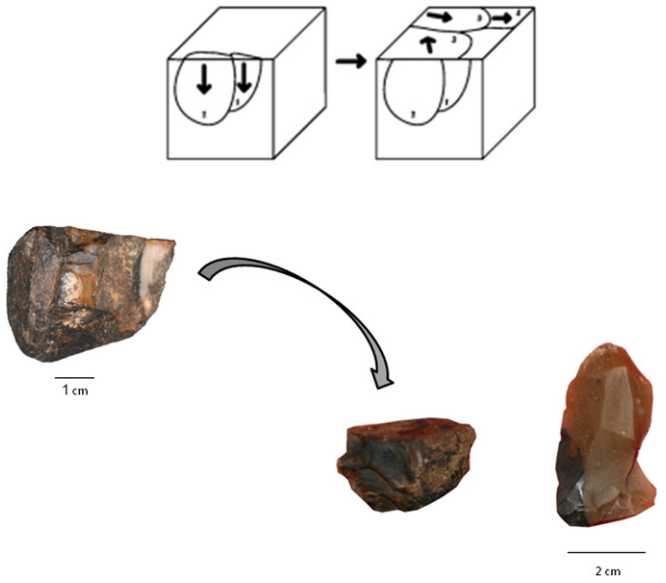

Fig. 7. Scheme of opportunistic débitage made on quadrangular pebbles.

(Fig. 8). Those cores types are quite unusual in the lithic assemblage, probably because the raw material workable size was smaller in most situations. Even here, cores were discarded before total exploitation.

No façonnage evidence was recorded in Pirro Nord. At this state of research, the employment of limestone cannot be rejected, but all the "knapped-like" limestone pieces (7) that were found during excavation are too much eroded to be sure about their anthropical origin. All those pieces are characterized by a distal cutting edge made by 2 or 3 removals, and they show a "chopping-tool morphology".

One hammer in limestone was also found (65 × 47 × 43 mm). It shows 2 specific areas of utilization (in the two apical parts) characterized by several small and concentrated cupules. No retouched

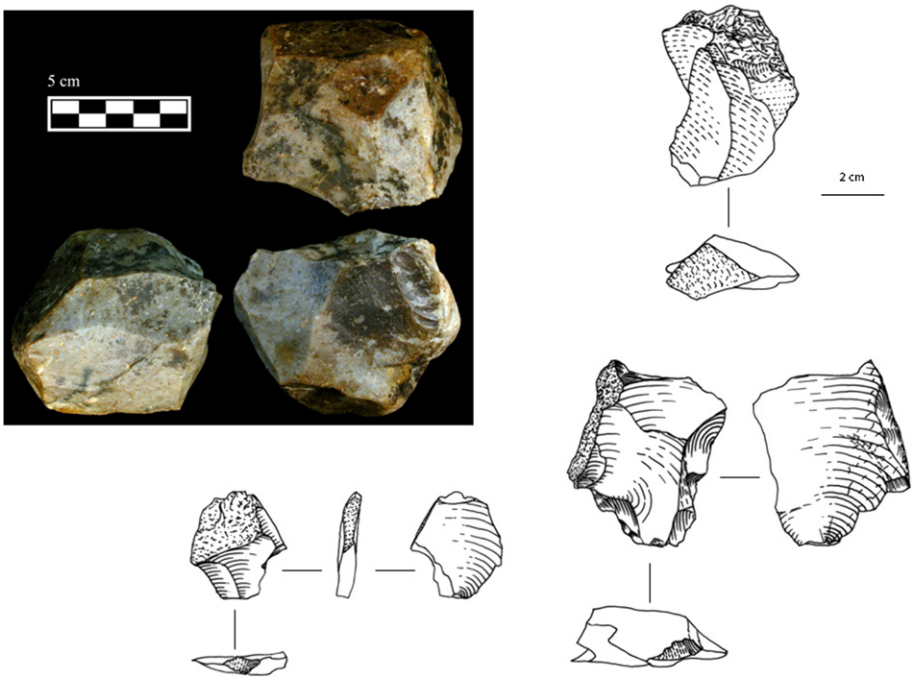

Fig. 8. Scheme of opportunistic débitage made on large pebbles.

pieces were found in the lithic assemblage, but one flake with a short, inverse, discontinuous retouch (probably due to utilization, according with the microscopical analysis) was found in the reworked sediments under the fissure.

3.3. General considerations about lithic materials

The lithic assemblage allows some general considerations about the knapping strategies, even if the number of recovered pieces is, at this state of research, quite poor. From a general point of view, the raw material supply area is restricted, in terms of distance, as it is usual for Lower Palaeolithic sites. The knapping strategies are strongly influenced by the exploited pebble morphology and they are finalized to obtain flakes with, at least, one cutting edge and sometimes two convergent cutting edges (centripetal débitage on small/medium rounded pebbles). Cores were almost never exploited to the end, probably because the raw material was copious and because the blanks needed to have a minimal dimension. The different knapping strategies have not produced characteristic flakes, and only some flakes from the centripetal débitage seem to be more predeterminated in terms of knapping direction organization.

4. Discussion and conclusions

Pirro Nord site, and especially the Pirro 13 fissure, represents an important attestation of the first European peopling. The lithic assemblage can be attributed to Mode 1 and shows most of the characteristics of the oldest European sites (de Lumley et al., 1988; Peretto et al., 1998; Carbonell et al., 2001, 2008; Peretto, 2005; Parés et al., 2006; Crochet et al., 2009; Toro-Moyano et al., 2009; Despriée et al., 2010). Moreover, some features seem to be very interesting as compared to other European sites dated between 1.0 and 1.7 Ma. The first is the employment of a centripetal method that is not always evident for this period in Europe, but is the predominant one at Pirro. This peculiarity can be obviously related to raw material morphology but also to possible choice by knappers. The second is the apparent absence of façonnage, normally associated with débitage production, and the total absence of retouched pieces.

Pirro 13 lithic assemblage shows, as do the other oldest sites, a large opportunism component in terms of the shortest and best way to reach a purpose. This feature has deeply influenced the blank morphology and the production strategies.

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