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New research perspectives on the lithic industry of Casal de' Pazzi forty years after the sites's discovery

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ABSTRACT - More than 40 years after the discovery of the Paleolithic open-air site of Casal De Pazzi (Rome, Italy), and about 35 years after the pioneering study of the lithic industry found at the site, the 2022 conference held in Rome [40 Years of Casal de' Pazzi in the framework of Pleistocene archeo-paleontological sites (400,000-40,000 BP): current knowledge and new research perspectives] provided the much-needed opportunity to resume a research that had been suspended for too long. Studies on the lithic industry were carried out in the late 1980s on a sample of approximately one-third of the whole assemblage found at the site, and they were conducted using methods and tools quite advanced for the time; thus, the results remain valid at the present day. In an era when computer tools were still extremely rare, a database was created with a substantial number of entries, both typological and technological. In recent years much has been done in the study field of lithic assemblages, promoting and expanding both the technological and taphonomic approaches. Furthermore, many reflections and studies have allowed for the in-depth exploration of issues related to fluvial deposits, which characterize a significant portion of the Lower-Middle Pleistocene sites in Europe and beyond. Subsequent inputs for new reflections on the aforementioned topics came from a further, albeit limited, excavation campaign carried out in 2013, which unearthed a section of a bank deposit that could be fully correlated with what was documented in the first excavation campaign. The new data have prompted a discussion on depositional setting and have allowed for a better understanding of the use and origins of the raw materials used. The objective of this work, based on the previous database, is to encourage a comprehensive study of the lithic assemblage and to correlate it with updated data on stratigraphy, possible more precise dating, and necessary investigations on faunal and floral assemblages.

Keywords: Roman Pleistocene; lithic industry; Casal de' Pazzi site.

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1. INTRODUCTION

The Pleistocene deposit of Rebibbia Casal de' Pazzi, now a museum open to the public (Gioia, 2020; Silvestri et al., 2023), is a significant archeological, paleontological, and geological site in the territory of Rome.

Of the numerous known Pleistocene sites, discovered from the end of '800 occasionally or through systematic research in the Agro Romano, this is one of the only two preserved and currently visible (Gioia and Zanzi, 2020; De Santis and Baroni, 2023).

The history of the site, from its discovery to the present, has also partly determined the fate of studies and research in the following years. In compliance with their primary mission, the institutions (i.e., the Soprintendenza Archeologica di Roma and the Sovrintendenza Capitolina ai Beni Culturali) that have dealt with the conservation of the deposit after its excavation, have mainly focused on communication of the already known data, as well as on their museumization. Over the years, this has led to somewhat overshadowing the advancement of scientific research on the available data of the site.

Yet the appreciation for the museum site has led both the researchers who have dealt with it in the past and new generations of specialists, to resume what had been left pending.

The completion of an accurate, up-to-date study of the abundant lithic industry assemblage (~1700 specimens that have yet to be precisely counted), integrated with previous studies on Casal de' Pazzi's artifacts, has become a priority, as it can provide new interpretive data on the site as well as, more widely, on the Middle Pleistocene industries.

2. THE ARCHEOLOGICAL SITE

The site, located in the N-E area of Rome (Fig. 1), between the Via Nomentana and the Via Tiburtina, was discovered in October 1981, during the construction of a collector of the sewage network related to the then-ongoing urbanization of the neighborhood.

In that circumstance a tusk of *Palaeoloxodon antiquus* (i.e., straight-tusked elephants), associated with lithic artifacts, was brought to light and, consequently, the works were suspended to start a systematic stratigraphic excavation (Fig. 2). The archeological research that followed, directed by Anna Paola Anzidei, led to the identification of a vast Pleistocene deposit, about 1300 m^2 wide.

The size of the excavation and the quantity of findings required the collaboration of various professional figures such as A.G. Segre for geology and stratigraphy, P. Cassoli for faunal remains, A. Bietti for archaeology, as well as the technical-scientific contribution of M. Ruffo, that conducted the excavation for 5 years (Ruffo et al., 2023). The research was extended to various places in the area undergoing construction works, for which core samples have provided valuable information toward a better understanding of the geological history of the area (Anzidei and Ruffo, 1984; Bietti, 1985; Bulgarelli et al., 1984; Anzidei et al., 1999; Rosa, 2023; Ruffo et al., 2023).

The site is at an elevation of 32 m above sea level and is located on the right bank of the Aniene River, an important tributary of the Tiber. It is characterized by sand and gravel deposits showing an alternate of 30-50 cm thick units with a fining-upward trend, whose deposition occurred within a fluvial channel. The volcaniclastic composition of the sediments suggests its provenance from the near Albano volcanic complex. In the southern area of the excavation, the deposit is about 2 m thick and is characterized by the presence of the largest number of tusks of straight-tusked elephants and the greatest concentration of fossil bones and lithic finds. The latter are prevalently concentrated at the base of the fluvial channel where are trapped with several boulders (for more details see Anzidei and Ruffo, 1984; Bietti, 1985; Anzidei et al.,1999; Gioia, 2004; Ruffo et al., 2023).

The lithic industry consists of about 1,700 Middle Paleolithic artifacts, mostly on flakes produced from small siliceous pebbles. The bone industry is represented by only one retouched fragment (Fig. 3) (Anzidei and Ruffo, 1985; Anzidei and Gioia, 1992).

The faunal assemblage (>2,000 remains) includes large herbivores, such as *Palaeoloxodon antiquus*, *Bos primigenius*, *Stephanorhinus kirchbergensis*, *Hippopotamus amphibius*, and other mammals (i.e. *Cervus elaphus*, *Equus* sp., *Dama dama*, *Sus scrofa*, *Canis lupus*, *Crocuta spelaea*), but also aquatic birds (*Anser albifrons*, *Anas Penelope*, *Anas streptera*, *Anas crecca*), and tortoises (*Emys orbicularis*) (Gioia, 2020; Palombo, 2023; Pandolfi et al., 2023).

In 1983, a human parietal fragment was discovered in the lowest layer, almost at the bottom of the succession (Fig. 4). The fragment was generally attributed to an archaic species

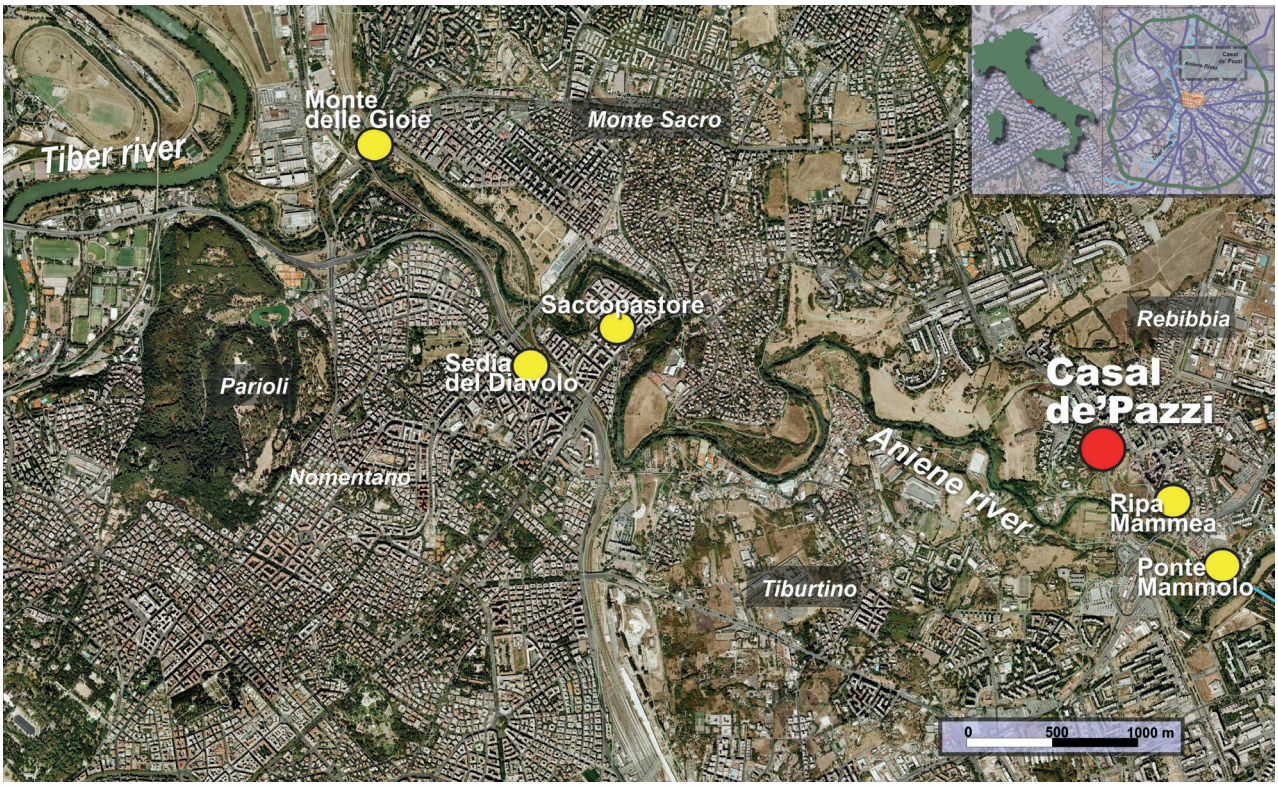

Fig. 1 - The sites of the lower Aniene valley located in an aerial photo of the area.

Fig. 2 - An overview of the excavation area in a historical photo from the 1980s.

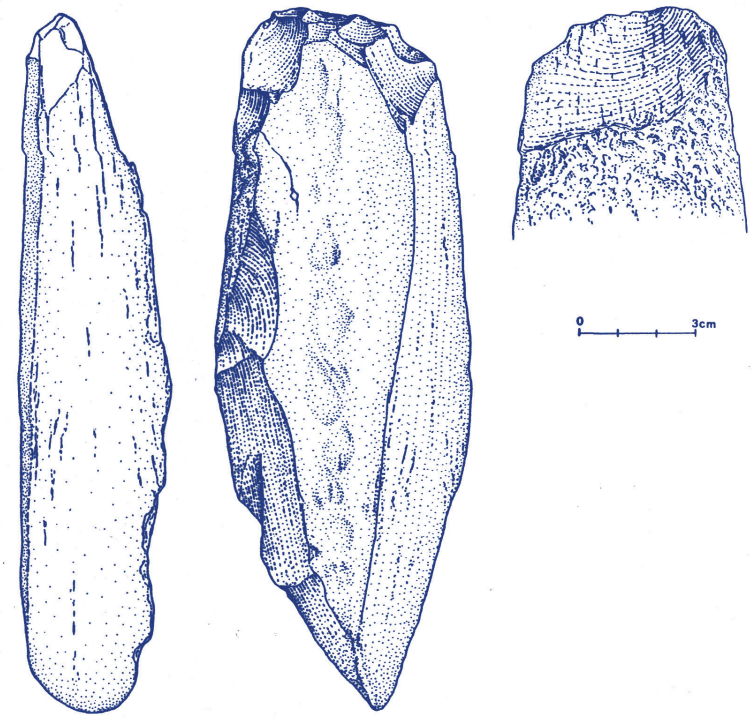

Fig. 3 - The only retouched bone fragment.

of *Homo*, then to *H. heidelbergensis*, (Passarello et al., 1987; Manzi and Passarello, 1989, 1991; Manzi et al., 1990; Gioia, 2020; Di Vincenzo and Manzi, 2023).

The Casal de' Pazzi deposit also yielded fossil leaf imprints of *Zelkova* sp., a tree of the family *Ulmaceae* widespread in peninsular Italy during the Middle Pleistocene but later extinct in this country, *Laurus nobilis* (laurel, an aromatic evergreen tree or large shrub), and *Cercis siliquastrum* (Judas tree), preserved in silt/clay layers (Magri, 2020).

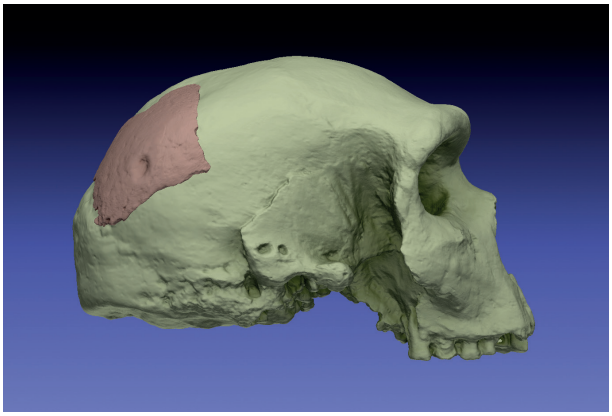

Fig. 4 - Placement of the skull fragment from Casal de' Pazzi in a 3D reconstruction of the Homo heidelbergensis of Petralona (Greece).

3. THE LITHIC INDUSTRY: AN OVERVIEW OF PAST STUDIES

3.1. EARLY METHODOLOGIES

The lithic assemblage is abundant and typologically varied, consisting of approximately 1700 artifacts, which are present in every layer, with the majority coming from the lower levels, in contact with tuff.

Following the first general considerations on the set of lithic artifacts (Anzidei and Ruffo, 1984; Bulgarelli et al., 1984; Bietti, 1985), between the late 1980s and early 1990s (Anzidei and Gioia, 1992), a new, albeit partial, study was carried out on a substantial sample of the lithic industry. The selected specimens were found in a specific excavation area, i.e., a row of squares (5x5 m) with a significant presence of lithic materials, also representative of the complex fluvial stratigraphy of the site (Figs. 5 and 6). In some squares (A6, A5, A4), the deposit was particularly thick and coincided with the centre of the riverbed, while in others (A3, A7, and A8), the deposit significantly thinned out, constituting the riverbank. A total of 431 lithic finds were studied on this occasion.

The technological and typological data have been processed by using the Reflex [Borland/Analytica, Inc. Copyright (c) 1987] software.

First of all, an analytical grid was established, laid out in

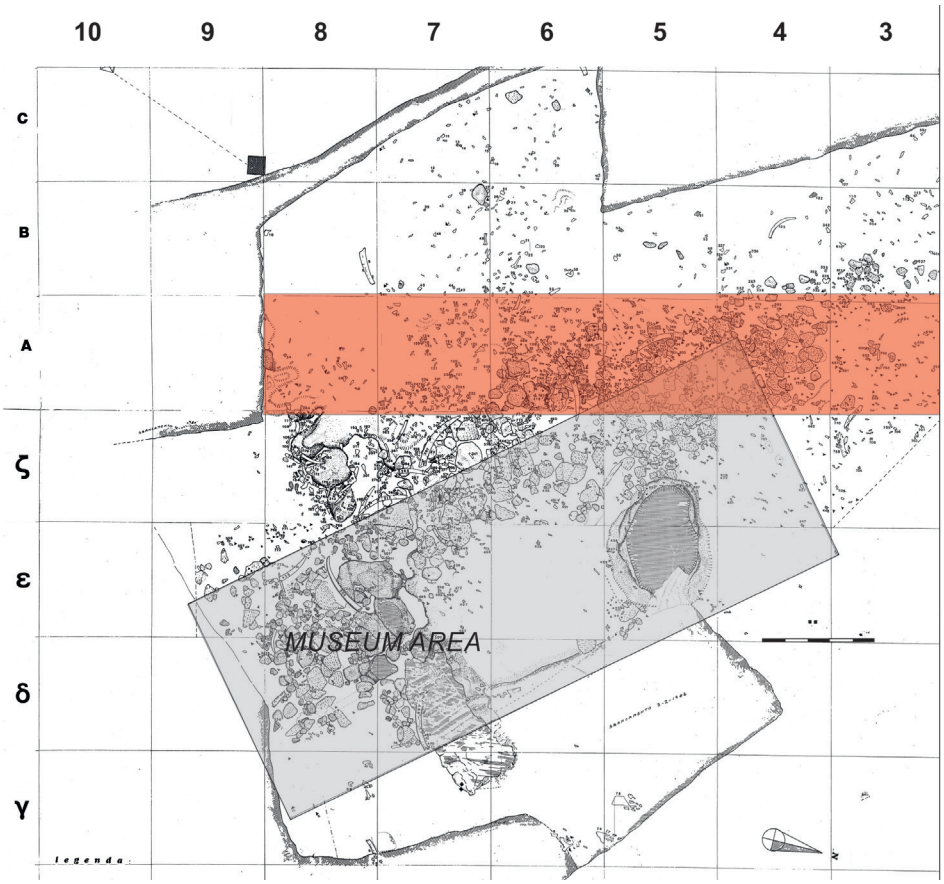

Fig. 5 - Location of the row of squares considered for the study of lithic industry in the late 1980s (from Anzidei and Gioia, 1992).

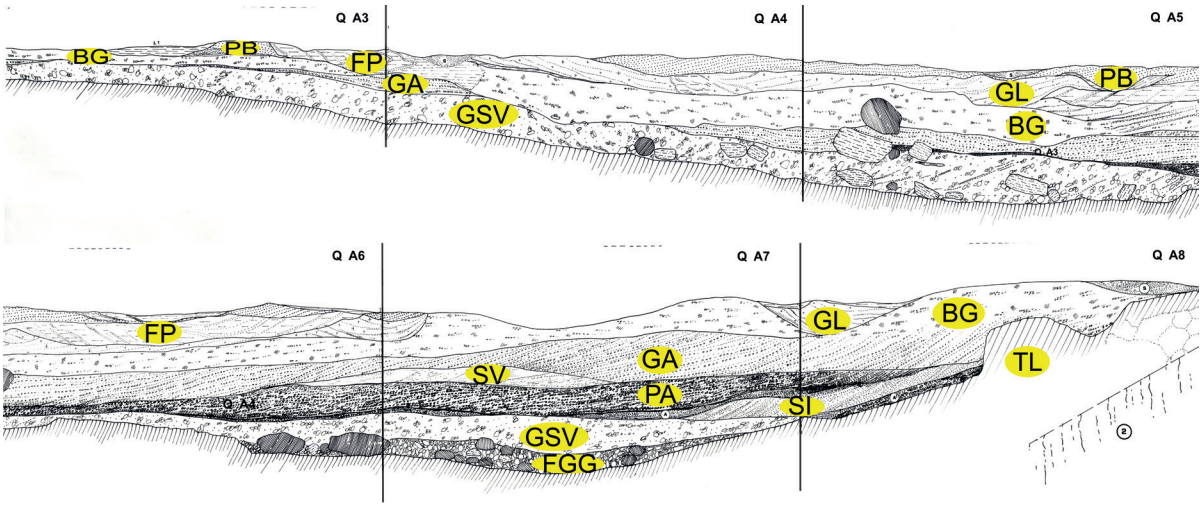

Fig. 6 - Stratigraphic sections of squares A3-A8. BG: coarse pyroclastics mixed with muddy clumps; FP: muds mixed with pyroclastic; GA: coarse pyroclastics stratified with augitic sands; GI: Little gravels mixed with incoherent sands; GL: fine-grained pyroclastics intercalated with augitic sands containing high concentrations of altered leucites; GP: augitic sand and calcareous little gravels; GSV: coarse pyroclastics mixed with grayish-green sands chaotic sediments; PA: coarse pyroclastics mixed with high concentrations of augitic sands; PGG: coarse pyroclastics mixed with sometimes augitic silty sands-cemented; SL: Sand and silt; PB: medium-grained pyroclastics stratified with augitic sands; SV: Varved sands with concave cross-bedding (The drawings and description of the layers was taken from the original documentation by Massimo Ruffo).

85 fields, which collect 'anagraphic' (layer, number, square, etc.), descriptive, typological, metrical, and technological data. The typological analysis was carried out using the Bordes method (Bordes, 1961). The typological analysis of the cores was carried out essentially using the J. and N. Chavaillon (Chavaillon and Chavaillon, 1981) study of African Lower Paleolithic cores. For débitage analysis and for retouch typology and technology, an analytical index was developed, based on the work of Tixier (1980), Brezillon (1977), Laplace (1968), Bisi et al. (1978), and Biddittu et al. (1972-74). This was a sequential database, but it also allowed statistical analysis not always possible with other software used at the time. In the 2000s the data were transferred to an Access database, which permitted a more articulated structuring of the data allowing one-to-many relationships for some fields.

3.2. SOME THOUGHTS ON THE RIVER DEPOSIT

The highest concentration of the analyzed artifacts (65.89%) was found in the GSV layer (Fig. 7), placed at the base of the fluvial channel, which consists of coarse pyroclastic gravels immersed in a sandy matrix. The GA level, composed of stratified coarse pyroclastics sands, is also rich in artifacts (15.31%). The PGG, BG, and PA levels, which also have a coarse grain size, yielded few artifacts, likely due to their marginal presence in the

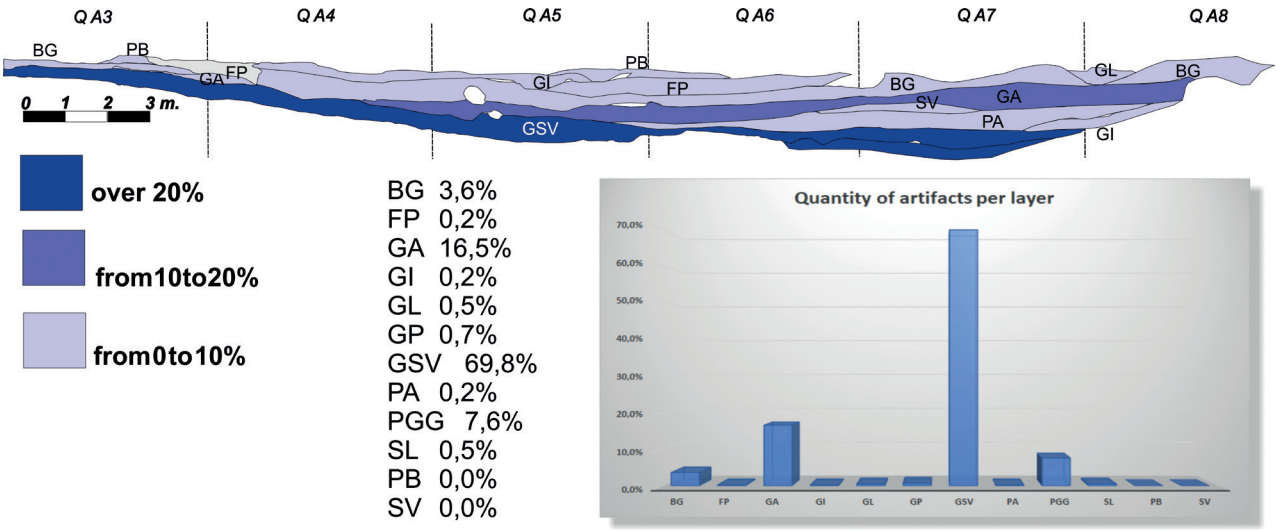

Fig. 7 - Quantity of artifacts per layer. The abbreviations used correspond to the names of the layers.

study area (Anzidei and Gioia, 1992).

Even though the size of the pieces needs to be correlated with the type of raw material used (as discussed below), it is also related to the composition and grain size of the layer in which they were found. In layers with a coarse grain size (e.g., GSV and GA), the implement sizes align well with the average estimated sizes of the gravel composing those layers (Figs. 8 and 9). However, in sandy or silty layers, the tool sizes tend to decrease, although not significantly. These types of sediments are deposited during phases of limited fluvial energy when the river can only transport smaller-sized materials. It is evident that the selection process carried out by the river, which eroded and carried away only objects of a size compatible with its transport force, winnowed the lithic assemblage, excluding objects of smaller or larger sizes. This phenomenon, where rivers selectively transport objects of a certain size, is not unique to this specific location but is a feature of many Middle Lower Paleolithic deposits across Europe and other regions. It reflects the natural processes of sediment transport and deposition by rivers (Mishra et al., 2007).

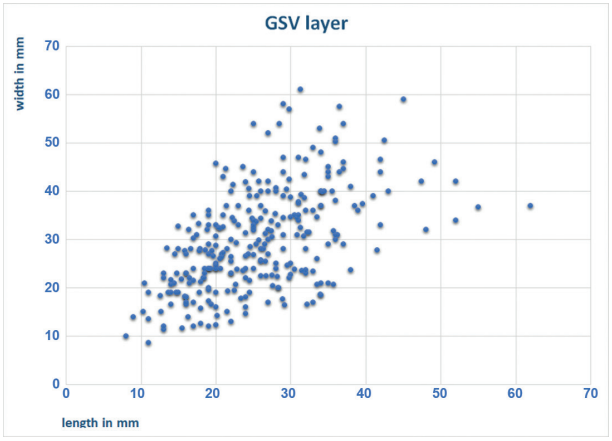

Fig. 8 - Dimensional analysis of the GSV Layer.

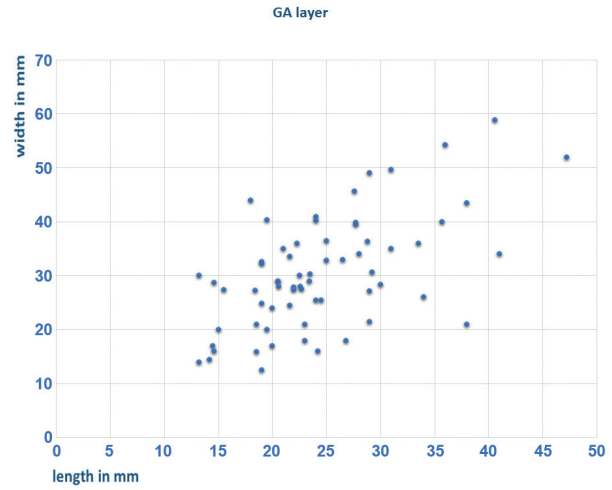

Fig. 9 - Dimensional analysis of the GA Layer.

3.3. ROLLING

The analyzed sample, even if limited, allows to outline a picture of the lithic industry. The first significant piece of evidence was the presence, in a fluvial deposit, of a high percentage of artifacts either fresh or with little rolling (Fig. 10). The analysis of a conspicuous part of the artifacts has allowed the identification of three types of rolling that do not seem to be linked to the stratigraphic position. The variability of the surface rounding and the type of deposit seem to support the hypothesis that lithic industry originated, perhaps at different times, from different contexts located at various distances from the site and were concentrated by the river in a single discovery location (Anzidei and Ruffo, 1985). Of course, the analyses conducted at that time were carried out using exclusively visual observations. Microscopic studies were not performed to establish with greater certainty the degree of fluvial reworking of the lithic materials, as suggested by recent studies. These studies have also included laboratory experiments to determine the possible distance of the original site from the subsequent fluvial deposition (Chambers, 2003; Chu et al., 2015; Cordier et al., 2017).

Moreover, the finds with a stronger degree of rolling do not present major technical, morphological, and typological characteristics which could differentiate them from the remaining industry. The stratigraphy of the deposit does not seem to impact on the type of association of finds contained in the various layers.

The overall good state of preservation of the analyzed artifacts still suggests that they may not have traveled over long distances. Another factor in favor of a particularly short journey for the artifacts before their redeposition in the river is their relative integrity (Figs. 11 and 12). Certainly, the continued study involving a comparison of abrasion data from the lithic industry with those from fossil remains of fauna, as being undertaken by Luca Pandolfi and the research group at the University

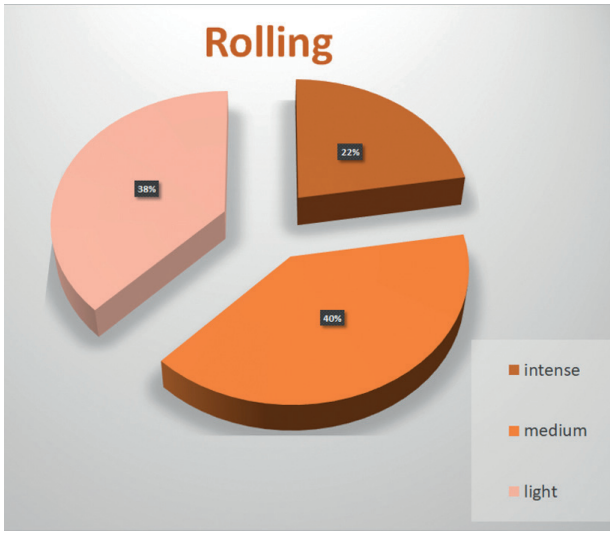

Fig 10 - Rolling of lithic artifacts.

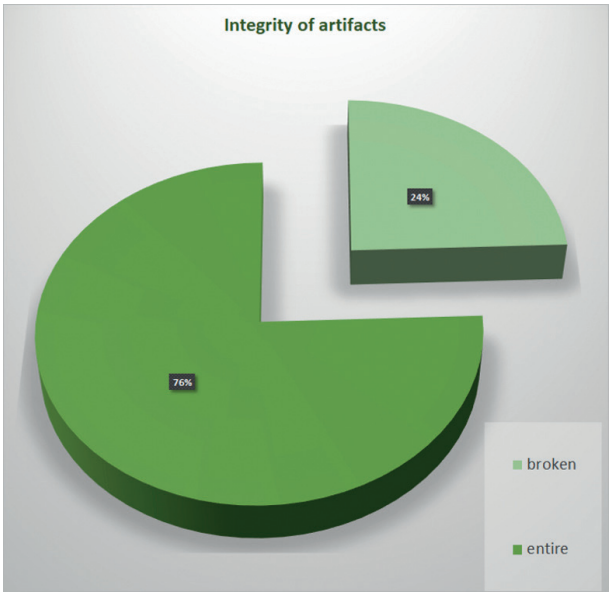

Fig. 11 - Integrity of lithic artifacts.

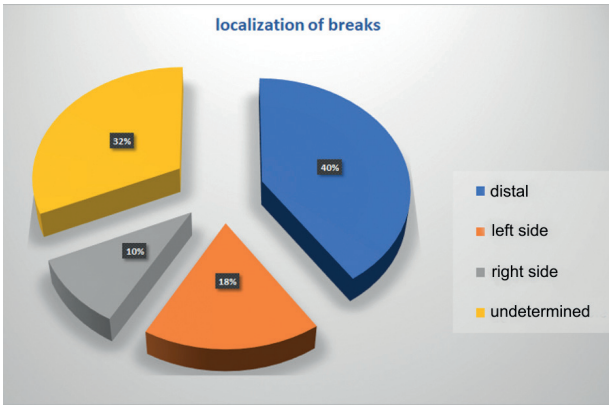

Fig. 12 - Localization of breaks.

of Basilicata holds great potential for enhancing our understanding of the site.

3.4. RAW MATERIALS: DATA FROM EXCAVATIONS IN THE 1980S AND 2013

In the dimensional analysis of the artifacts, in addition to their stratigraphic position, the identification of the raw material always plays an important role. The primary raw material at Casal de' Pazzi consists mostly of small-sized pebbles and can be classified into two main subtypes: a medium-fine-grained flint-type with a light color ranging from yellow to grey, and occasionally red and brown (referred to as Type 1), and a grey flint-type with numerous inclusions (Type 2) (Anzidei et al., 1999). Other types of raw materials are present to a lesser extent (Anzidei and Gioia, 1992) (Fig. 13).

The study revealed a preference for using high-quality flint for tool production (68.69%), while only 27.65% of the tools were made from local pebbles of flint (Flint Type 2). The use of local flint pebbles increases in the production of unretouched flakes probably expedient tools (42.42%) (Anzidei and Gioia, 1992). This conclusion has been confirmed by the characteristics of most of the pebbles found during the excavations in the 1980s (Anzidei et al., 1999) and has been further corroborated by data from the 2013 excavation (Gioia et al., 2015), on the occasion of the rearrangement of the "Pleistocene" garden during the completion of the Museum. The discovery of layers of fluvial origin necessitated the opening of a new excavation area (Fig. 14), organized into 5x5 m squares in alignment with the grid from the previous survey campaign.

Excavation operations revealed a succession of gravelly and sandy sediments of fluvial origin overlaying the partially eroded tuffaceous layer. These layers corresponded to those previously described in the larger deposit excavated in the 1980s. Sections from the old excavation, the closest ones to the current investigation area, were referenced for this study. The 2013 investigations unveiled a similar stratigraphic succession, albeit less intricate due to the peripheral location of the new excavation area compared to the central riverbed investigated in the prior campaign. The sediment thickness in the new area was less than 30/40 cm, while the deposits in the central zone exceeded 2 meters in height. All pebbles and siliceous fragments, both artifacts and natural pebbles, equal to or larger than 5 cm were systematically collected (Gioia et al., 2013; Brunelli, 2014).

Consistent with earlier observations, two primary types of flint were identified: a fine-grained type (Type 1) and another rich in inclusions (Type 2). The collected natural sample comprised 88.55% of the second type of flint, which also dominated among the unretouched flakes (62.67%). Interestingly, no whole pebble was of Type 1 flint. The prevalence of Type 2 flint, defined as "granular" in prior studies, over fine-grained flint indicated the knowledge of human groups regarding the outcrops of good-quality flint and their ability to traverse great distances (see below) to obtain the most suitable raw material for crafting specific tools. The analysis of these pieces further revealed that Type 2 flint was inadequate for creating well-crafted tools due to its lack of homogeneity, texture, isotropy, and continuity, essential characteristics

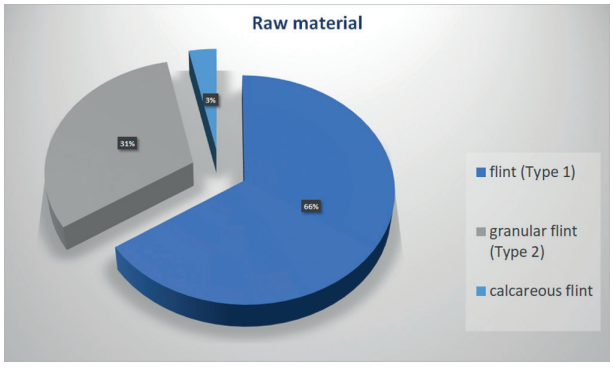

Fig. 13 - Row materials.

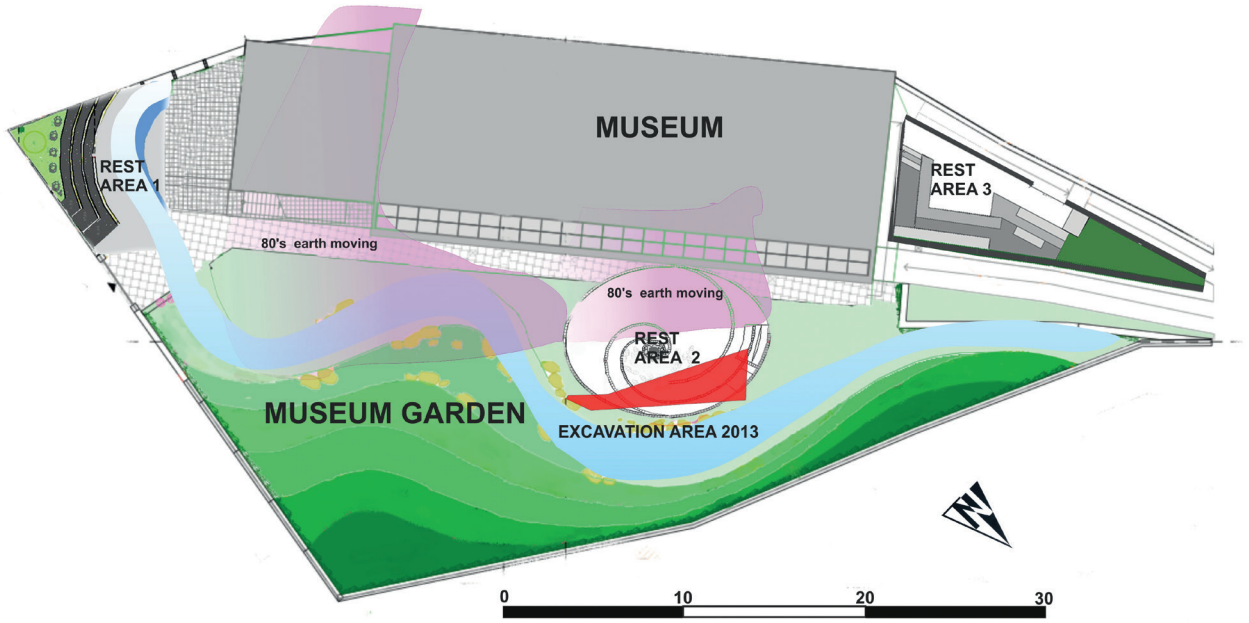

Fig. 14 - Location of the 2013 excavation area within the project for the arrangement of the museum garden.

for effective flaking. Nevertheless, the choice to use this lesser-quality material, likely for certain activities, was highly influenced by the substantial distance from better-quality resources (Fig. 15).

Understanding the origins of these two flint types is crucial not only for comprehending the choices made by ancient human groups in obtaining the most suitable raw material for tool production but also for shedding light on the Casal de' Pazzi river's fluvial path. The presence of numerous Type 2 flint pebbles in the riverbed is a significant indicator in this regard.

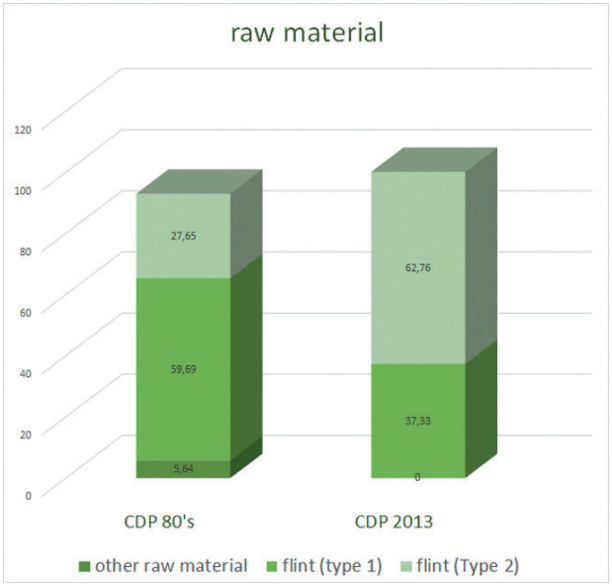

Fig. 15 - Comparison between the raw materials documented in the two excavation campaigns. In the case of the 2013 excavation, not only artifacts but also all collected natural pebbles were considered.

In the 1990s, in order to identify the source of the two flint types, a geological study of the area was conducted, first by listing and mapping the pebbly sediments and rocks containing flint, using the geological maps available and then by checking the pebble formations in the field (Anzidei et al., 1999) (Fig. 16). The research indicates that Type 1 flint is found both in the Pontine plain (Ps) and on the high terrace of the Tiber River, near Stimigliano (To), approximately 50 kilometers north of Casal de' Pazzi. On the other hand, Type 2 flint appears to have a local origin (Sp, Si, Ri, Rs).

Further information on flint outcrops was published by Caputo et al. (2001). Flint resources are scarce in the Roman area and consist in pebble deposits. They are limited to Pliocene and Quaternary fluvial and marine deposits. Four flint provinces were identified (Fig. 17). The paper suggests that the two types of flint at this location do not come from the Tiber flint province. Instead, it is proposed that the primary type of flint (Type 1, light colored, unweathered) likely comes from the pebbly formations of the Pontina flint province. On the other hand, the Type 2 flint (grey with inclusions) is believed to originate from the pebbly formations of the Sabina flint province, possibly sourced from the ancient riverbed of the paleo-Aniene.

3.5. TYPOLOGY

The analyzed lithic industry primarily consists of flakes, with a minor presence of blade artifacts or elongated supports, likely incidental in the reduction sequence. There appears to be a deliberate preference for using pebbles and core fragments as support in crafting tools (Anzidei and Gioia, 1992). The bulbs, predominantly simple, affirm a standard technique for detaching flakes and do not display variations linked to the raw material. The butts are mainly

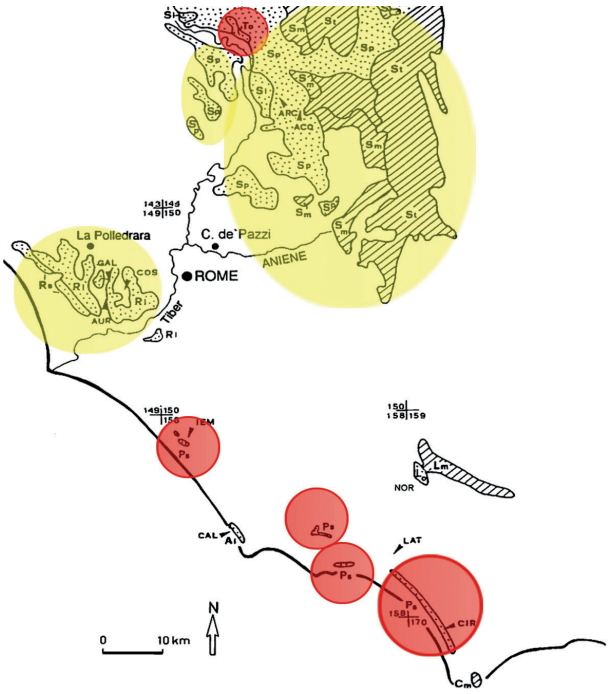

Fig. 16 - Location of areas with flint presence (modified from Anzidei et al., 1999). The abbreviations correspond to the geological map, with yellow indicating Type 2 flint outcrops and red indicating Type 1 flint outcrops. Ps: Coastal deposits of the Pontine plain, Upper Pleistocene; Sp: River deposits in the Sabine area, Plio-Pleistocene; Si: River deposits in the Sabine area, Middle Pleistocene; Ri: River deposits west of Rome (Ponte Galeria and related formations), Middle Pleistocene; Rs: Coastal deposits west of Rome, Upper Pleistocene; To: Tiber terrace, Holocene.

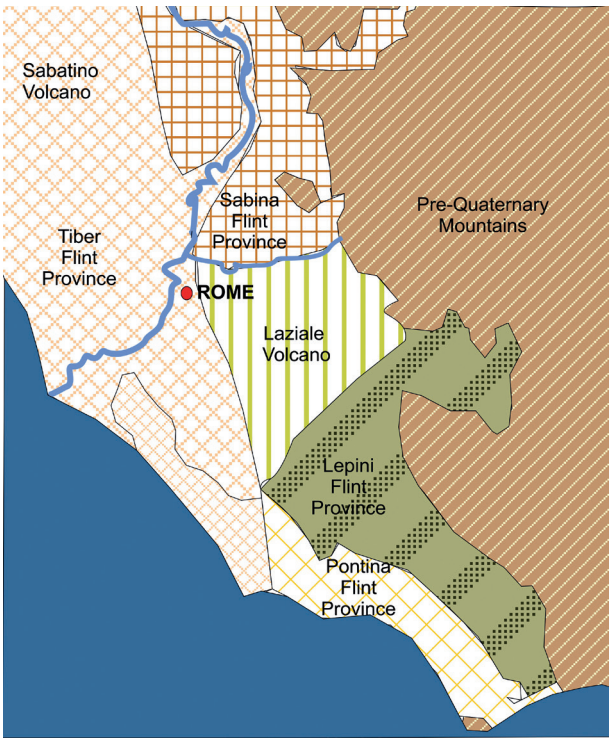

Fig. 17 - Proposal for "flint provinces" of the area around Rome (modified from Caputo et al., 2001).

cortical, flat, and dihedral. The typology of butts highlights the good presence of cortical, flat, and dihedral ones. The high percentage of unrecognizable ones is often linked to Type 2 flint and the fractures caused by the type of raw material used (Fig. 18).

The tools exhibit a notable predominance of scrapers (Fig. 19) and feature a rather extensive retouch affecting an average of 43% of the entire surface. In 41.1% of cases, the retouch affects more than one side, being continuous, direct, and generally accurate (Fig. 20).

The site's lithic industry has been frequently compared with findings from nearby sites such as Monte delle Gioie and Sedia del Diavolo (Taschini, 1967). While these sites are represented by a small number of specimens, they share several commonalities with those from Casal de Pazzi. A recent study (Soriano and Villa, 2017) aims to reconstruct the operational chain recorded at both sites. This study underscores the presence of the Levallois technique in both sites, despite their early chronologies (between 295 and 290 ka), signifying a transition from the Lower Paleolithic to the Middle Paleolithic (Moncel et al., 2020). Consequently, these two sites could be among the earliest evidence in Italy of techniques involving core predetermination. At Casal de' Pazzi, the Levallois index is nearly zero, even though a technological approach aimed at reconstructing operational chains hasn't been implemented.

Comparison with Torre in Pietra (Blanc, 1955; Malatesta, 1978) also reveals significant points of interest. In this case, as well, scrapers dominate in the two levels 'm' and 'd' (Piperno and Biddittu, 1978; Grimaldi, 1998; Anzidei et al., 2001). However, at Torre in Pietra, bifacial artifacts are well documented in the 'm' level, while the Levallois technique is abundant in the upper level. Despite the differences, considering purely typological and partly technological aspects, the lithic industry of Casal de' Pazzi appears to occupy an intermediate position between the 'm' and 'd' levels of Torre in Pietra (Anzidei and Gioia, 1992) (Fig. 21).

4. CONCLUSIONS AND FUTURE RESEARCH PERSPECTIVES

The existing studies on the lithic industry of Casal de' Pazzi, though dated, have laid the groundwork for further research. This research should delve into the technologies employed for artifact production - only a quarter of which has been previously studied - and various aspects regarding the origin of raw materials.

The lithic industry includes elements pointing to the early Middle Paleolithic, even in the absence of the Levallois technique. It is crucial to emphasize that the presence of this technique does not exclusively define the early Middle Paleolithic (Kuhn, 2013).

A crucial avenue for future research entails a comprehensive analysis of the recovered industry, with a focus on studying technologies and reconstructing operative sequences (Grimaldi and Santaniello, 2018). This research should adopt an interdisciplinary approach, considering various reference points to address doubts

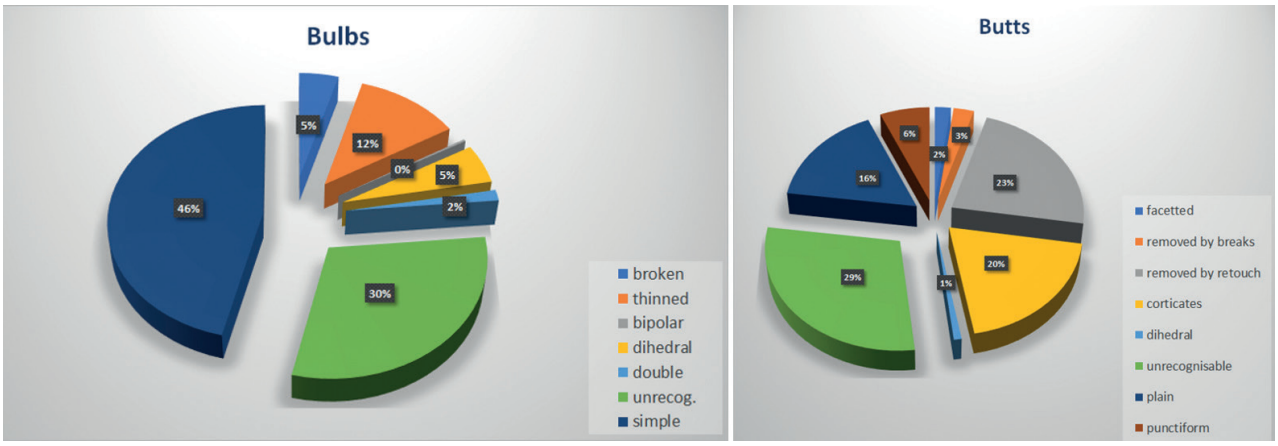

Fig. 18 - Percentages of bulb and butt types identified in the lithic sample studied in the 1980s.

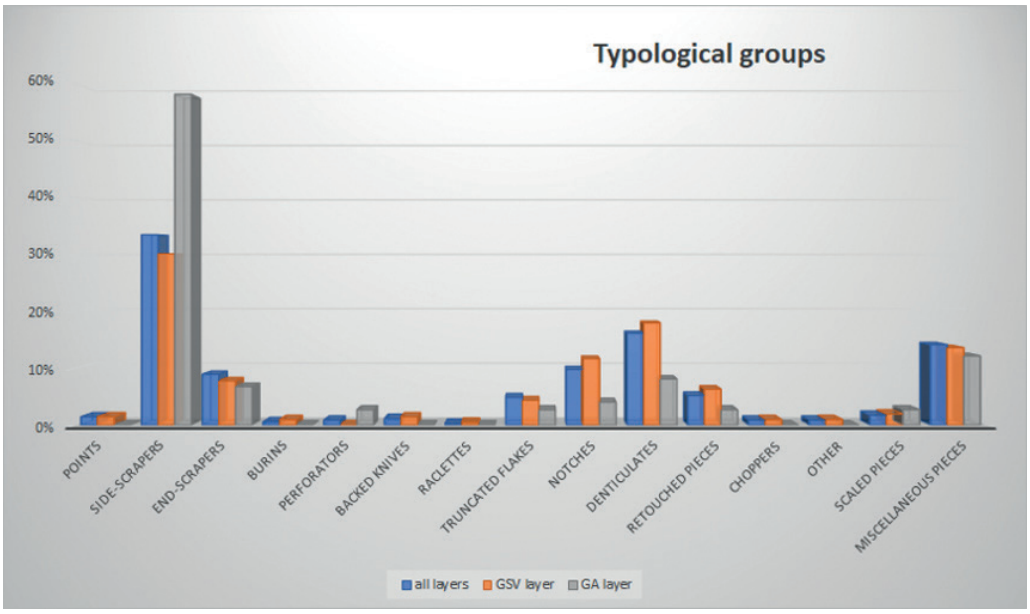

Fig.19 - Typological groups.

and inquiries regarding the lithic industry.

It is evident that solely analyzing the lithic industry, even in prospective future studies, cannot fundamentally resolve the issue of dating the Casal de' Pazzi site. Early categorizations placing it in the Rissian period (Segre, 1983) have seen additional insights through studies of dating sites in the Aniene Valley (Marra et al., 2017), which align the site, in concordance with previous research, within MIS 7, primarily due to the presence of significant fluvio-lacustine blocks, lionato tuff blocks, and Villa Senni tuff blocks at the river channel's base.

We think that this data provides just a *post-quem* terminus. The entire fluvial stratigraphy is evidently subsequent to the Aurelia Formation (MIS 9). However, the available data does not enable a precise determination of how much later this period is from MIS 9. The dating issue underscores the need for further multidisciplinary research and a comprehensive investigation of multiple aspects beyond just the lithic industry.

The currently available paleontological data do not offer precise chronological placement for the site generically indicating a Middle Pleistocene age, though a possible correlation to MIS 8.5 cannot be excluded (Palombo, 2023). Faunas identified at Casal de' Pazzi have a long presence over time during the Middle Pleistocene, and none currently characterizes a specific chronological phase.

New potentially valuable information could come from new palaeobotanical studies, which can now take advantage of various pollen extraction techniques from sediment (Magri et al., 2015), even under non-ideal conditions. These techniques have not yet been used on samples from Casal de' Pazzi. In particular, the use of heavy liquids (Munsterman and Kerstholt, 1996) or ultrasonic bath filtration (Perrotti et al., 2018) could yield good results for pollen extraction.

Absolutely, the integration of geological, stratigraphic, paleontological, and paleobotanical data, coupled with

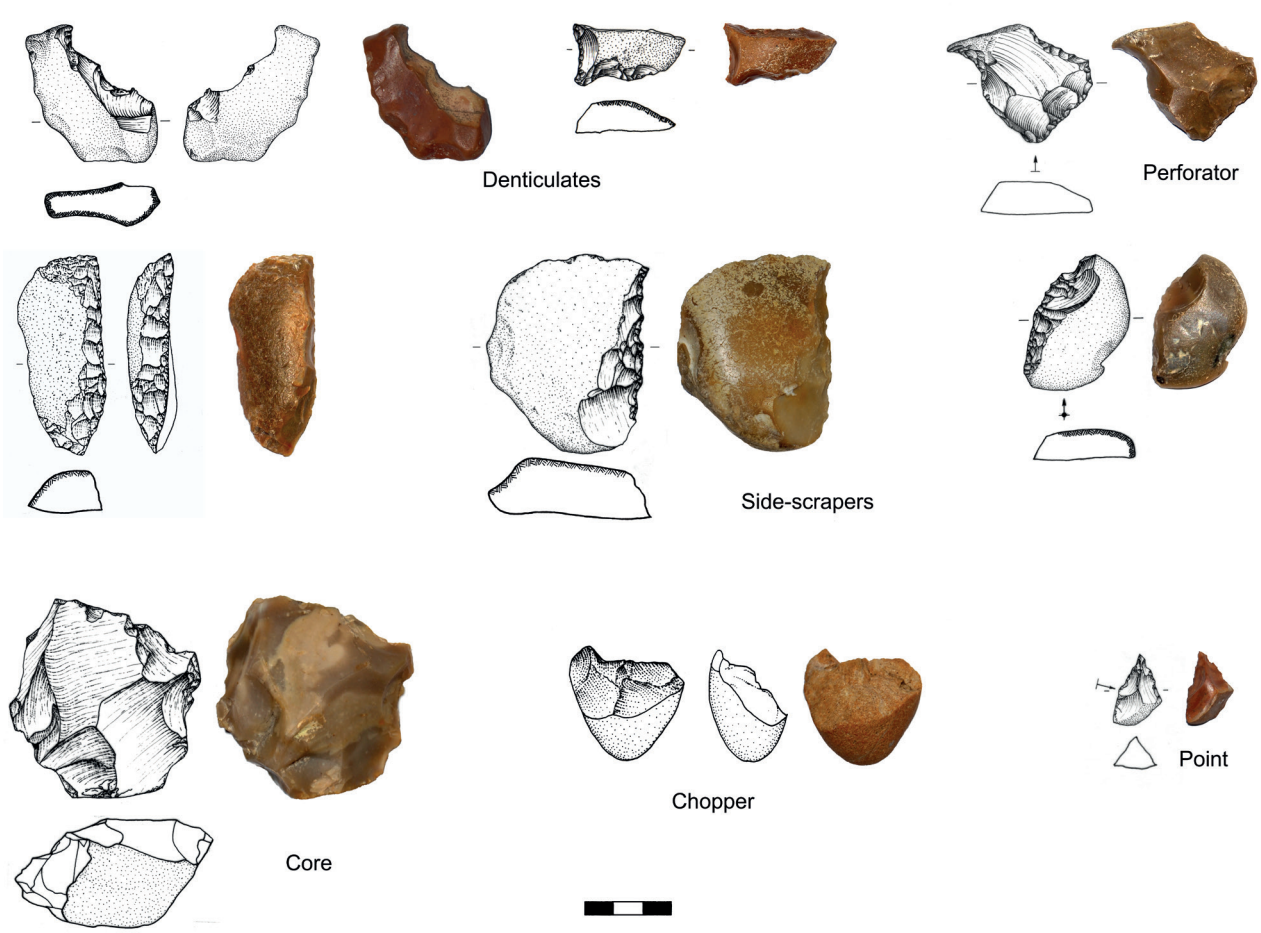

Fig. 20 - Some tools from Casal de' Pazzi site.

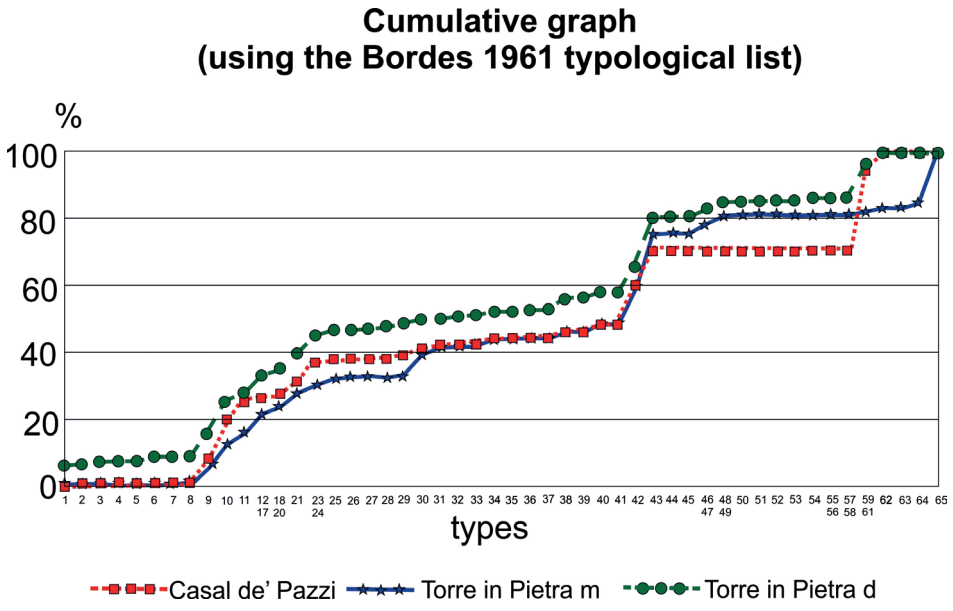

Fig. 21 - The cumulative graph (according to the Bordes 1961 method) compares the lithic industry of the 'm' and 'd' layers of Torre in Pietra with that of Casal de' Pazzi.

new and in-depth studies on archeological evidence, holds immense promise for achieving a more precise and reliable chronological placement for the Casal de' Pazzi site.

In sum contextualizing the site within its environmental and chronological framework is imperative and includes the following elements:

1. **Complete studies on lithic artifacts**: i.e resuming studies on the typology and, above all, the technology of the significant lithic industry found over time.

2. **Artifact composition**: i.e. investigating if the composition of coarse layers, which preserve most artifacts, might have excluded larger ones like bifacial tools.

3. **Comprehensive studies on fossil remains**: studies on fossil remains have recently resumed and they should also consider taphonomy and the different degree of fluvial transport of the pieces, to be correlated with that of the lithic industry.

4. **New paleobotanical analyses**: with the use of suitable and more modern technologies, it may be possible to obtain more comprehensive data on the documented floral assemblage in the deposit.

5. **Review stratigraphy**: revaluing the documented stratigraphy by Massimo Ruffo, correlating it with stratigraphy documented during the 1980s excavations that might no longer be visible.

6. **Dating within in situ layers**: exploring potential dating opportunities within in situ layers and specific locations nearby.

7. **River characteristics**: i.e understanding the type of river that could preserve such significant thickness, especially considering the upper part of the fill exceeding two meters.

8. **Preservation conditions**: i.e determining the type of watercourse and flow conditions that could sustain the remains.

9. **Geomorphological studies**: to ascertain the direction of the river flow within its larger context.

10. **Raw material origins**: investigating the origin of raw materials, particularly local ones, to comprehend the source of Type 2 flint found in the riverbed.

Addressing these aspects through rigorous interdisciplinary research will not only enrich our understanding of the Casal de' Pazzi site but also contribute significantly to broader knowledge about the early Middle Paleolithic and the prehistoric context in which this lithic industry emerged.

This type of study can also be conducted through a correct and modern examination of archival data from old excavations, as demonstrated by the excellent work of Méndez-Quintas et al. (2023). It is evident that all these questions are of fundamental importance to frame the site within its environmental and, above all, chronological context.

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REFERENCES

Anzidei A.P., Gioia P., 1992. The lithic industry from Rebibbia-Casal de' Pazzi. Paper of Fourth Conference on Italian Archaeology. New Developments in Italian Archaeology, Part 1, 155-179.

Anzidei A.P., Ruffo M., 1984. Il deposito pleistocenico di Rebibbia-Casal de' Pazzi. In: Bietti A.M. (Ed.), Preistoria e Protostoria del Territorio di Roma. Leonardo Arte, Firenze, 94-104.

Anzidei A.P., Ruffo M., 1985. The Pleistocene deposit of Rebibbia-Casal de'Pazzi (Rome - Italy). In: Malone C., Stoddarts S. (Eds), Papers in Italian Archaeology IV Part 1. The human landscape. BAR International Series 243, 69-85.

Anzidei A.P., Biddittu I., Gioia P., Mussi, M. Piperno M., 2001. Lithic and bone industries of OIS 9 and OIS 7 in the roman area. In: Cavarretta G., Gioia P., Mussi M., Palombo M.R. (Eds.), The World of Elephants. Proceedings of the 1st International Congress, 16-20 October 2001 Roma, CNR, 3-9.

Anzidei A.P., Arnoldus-Huyzendveld A., Lemorini C., Caloi L., Palombo M.R., 1999. Two Middle Peistocene sites near Rome (Italy): La Polledrara di Cecanibbio e Rebibbia-Casal de' Pazzi. In: Gaudzinski S., Turner E. (Eds.), The Role of Early Humans in the Accumulation of European Lower and Middle Paleolithic Bone Assemblages. Monographien des Römisch-Germanischen Zentralmuseums 42. Mainz, 173-195.

De Santis A., Baroni I., 2023. La Polledrara di Cecanibbio (Rome, Italy): preserving and narrating the Pleistocene. In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 433-441.

Biddittu I., Cardarelli F., Piperno M., 1972-74. Proposta di una scheda tipo per la catalogazione e codificazione dei dati relativi a industrie su scheggia del Paleolitico inferiore e medio. Bullettino di Paletnologia Italiana, Nuova Serie 81,

9-25.

Bietti A., 1985. A late Rissian deposit in Rome: Rebibbia-Casal de' Pazzi. In: Delson E. (Ed.), Ancestors: The Hard Evidence. Alan R. Liss., New York, 277-282.

Bisi F., Guerreschi A., Peretto C., 1978. Schema raccolta dati e codificazioni per lo studio delle industrie su scheggia. Preistoria Alpina 14, 173-183.

Blanc A.C., 1955. Giacimento Paleolitico inferiore di Torre in Pietra. Quaternaria 2, 305-308.

Bordes F., 1961. Typologie du Paléolithique ancien et moyen. Mémoire n.1. Publications de l'Istitut de Préhistoire de l'Université de Bordeaux. Delmas, Bordeaux.

Brezillon M.N., 1977. La dénomination des objets de pierre taillée. Matériaux pour un vocabulaire des préhistoriens de langue française. IV supplément Gallia Prehistoire 2° edition. Centre National de la Recherche Scientifique, Paris.

Brunelli E., 2014. Indagine preliminare sulla tafonomia di un deposito pleistocenico: Rebibbia - Casal de Pazzi (Roma). Unpublished MA Thesis in Prehistoric Archaelogy (Supervisor: Prof. Margherita Mussi, Prof. Patrizia Gioia), University of Rome "La Sapienza".

Bulgarelli G., Piperno M., Zevi F. (Eds.), 1984. I primi abitanti d'Europa: 1500,000-100,000 anni: Museo Nazionale preistorico etnografico Luigi Pigorini. Catalogo della Mostra, Roma, De Luca.

Caputo C., Arnoldus-Huyzendveld A., Pugliese F., 2001. The Roman area natural environment: geomorphological features and lithic resources. In: Cavarretta G., Gioia P., Mussi M., Palombo M.R. (Eds.), The World of Elephants. Proceedings of the 1st International Congress, 16-20 October 2001 Roma, CNR, 27-33.

Chambers J.C., 2003. Like a rolling stone? The identification of fluvial transportation damage signatures on secondary context bifaces. Lithics 24, 66-77.

Chavaillon J., Chavaillon N., 1981. Galets aménagés et nucleus du Paléolithique inférieur. In: Balout L. (Ed.), Préhistoire Africaine. A.D.P.F., Paris, 283-292.

Chu W., Hosfield R., 2020. Lithic artifact assemblage transport and microwear modification in a fluvial setting: A radio frequency identification tag experiment. Geoarchaology 35, 591-608.

Cordier S., Briant B., Bridgland D., Herget J., Maddy D., Mather A., Vandenberghe J., 2017. The Fluvial archives group: 20 years of research connecting fluvial geomorphology and palaeoenvironments. Quaternary Science Reviews 166, 1-9.

Di Vincenzo F., Manzi G., 2023. *Homo heidelbergensis* as the Middle Pleistocene common ancestor of Denisovans, Neanderthals and modern humans. In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 303-315.

Gioia P. (Ed.), 2004. Elefanti a Roma. Roma, Palombi Editori.

Gioia P. (Ed.), 2020. Il Museo di Casal de' Pazzi Racconta Quando a Roma Vivevano gli Elefanti. Soveria Mannelli, Rubbettino.

Gioia P., Baroni I., Brunelli E., Milli S., Rosa C., Zanzi G.L., 2014. Casal de' Pazzi. Recenti scavi nel giardino del Museo, (Municipio IV). Bullettino della Commissione Archeologica Comunale di Roma 115, 374-380.

Gioia P., Zanzi G.L., 2020. I siti pleistocenici romani, nel quadro del popolamento umano in Italia e nel Lazio. In: Gioia P. (Ed.), Il Museo di Casal de' Pazzi Racconta Quando a Roma Vivevano gli Elefanti. Soveria Mannelli, Rubbettino, 66-89.

Grimaldi S., 1998. Analyse technologique, chaîne opératoire et objectifs techniques. Torre in Pietra (Rome, Italie). Paléo 10, 109-122.

Grimaldi S., Santaniello F., 2018. La tecnologia litica in Italia. Riflessioni sullo studio delle industrie litiche preistoriche dopo 30 anni di "Metodo Boëda". IpoTESI di Preistoria 10, 1-28.

Kuhn S.L., 2013. Roots of the Middle Paleolithic in Eurasia. Current Anthropology 54, 255-268.

Laplace G., 1968. Recherches de typologie analitique. Origini 2, 7-64.

Magri D., 2020. Il bosco perduto. In: Gioia P. (Ed.), Il Museo di Casal de' Pazzi Racconta Quando a Roma Vivevano gli Elefanti. Soveria Mannelli, Rubbettino, 165-169.

Magri D., Di Rita F., 2015. Archaeopalynological preparation techniques. In: Yeung, E.C.T., Stasolla C., Sumner M.J., Huang B.Q. (Eds.), Plant Microtechniques and Protocols. Springer International Publishing, 495-506.

Malatesta A. (Ed.), 1978. Torre in Pietra Roma. Quaternaria 20, 209-591.

Manzi G., Passarello P., 1989. From Casal de' Pazzi to Grotta Breuil: fossil evidence from Latium (Central Italy) before the appearance of modern humans. Animal and Human Biology 1, 111-143.

Manzi G., Passarello P., 1991. Anténéandertaliens et Néandertaliens du Latium (Italie centrale). L' Antropologie 95, 501-524.

Manzi G., Salvadei L., Passarello P., 1990. The Casal de'Pazzi archaic parietal: comparative analysis of new fossil evidence from the Late Middle Pleistocene of Rome. Journal of Human Evolution 19, 751-759.

Marra F., Ceruleo P., Pandolfi L., Petronio C., Rolfo M.F., Salari L., 2017. The aggradational successions of the Aniene River Valley in Rome: age constraints to early neanderthal presence in Europe. PLoS ONE 12, e0170434.

Méndez-Quintas E., Melis R.T., Altamura F., Di Bianco L., Panera J., Ruta G., Serodio Domínguez A., Sánchez-Dehesa Galán S., Mussi M., 2023. Archeology in "stone line" sedimentary environments. A methodological approach and results based on the Early and Middle Pleistocene sites at Melka Kunture (Upper Awash, Ethiopia). In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 317-346.

Mishra S., White M.J., Beaumont P., Antoine P., Bridgland D.R., Limondin-Lozouet N., Santisteban J.I., Schreve D.C., Shaw A.D., Wenban-Smith F.F., Westaway R.W.C., White T.S., 2007. Fluvial deposits as an archive of early human activity. Quaternary Science Reviews 26, 22-24.

Moncel M.H., Ashton N., Arzarello M., Fontana F., Lamotte A., Scott B., Muttillo B., Berruti G., Nenzioni G., Tuffreau A., Peretto C., 2020. Early Levallois core technology between Marine Isotope Stage 12 and 9 in Western Europe. Journal of Human Evolution 139, 1-25.

Munsterman D., Kerstholt S., 1996. Sodium polytungstate, a new non-toxic alternative to bromoform in heavy liquid separation. Review of Palaeobotany and Palynology 91, 417-422.

Palombo M.R., 2023. The Casal de' Pazzi mammalian fauna: biochronological and paleoecological notes, and research perspectives. In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 81-105.

Pandolfi L., Martino R., Palombo M.R., 2023. New insights on the fossil mammals from Casal de'Pazzi (Rome). In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 107-125.

Passarello P., Salvadei L., Manzi G., 1985. Il parietale umano del deposito pleistocenico di Casal de' Pazzi (Roma). Rivista di Antropologia 63, 287-298.

Perrotti A.G., Siskind T., Bryant M.K., Bryant V.M., 2018. Efficacy of sonication-assisted sieving on Quaternary pollen samples. Palynology 42, 466-474.

Piperno M., Biddittu I., 1978. Studio tipologico ed interpretazione dell'industria aucheuleana e pre-musteriana dei livelli m e d di Torre in Pietra (Roma). Quaternaria 20, 441-536.

Rosa C., 2023. The Casal de' Pazzi site in the light of new geological and geomorphological data. In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 69-79.

Ruffo M., Saracino B., Zanzi G.L., 2023. Casal de' Pazzi, excavation notes. In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 61-66.

Segre A.G., 1983. Geologia quaternaria e Paleolitico nella bassa valle dell'Aniene, Roma. L'Uomo di Saccopastore e il suo Ambiente. I Neandertaliani nel Lazio. Rivista di Antropologia 62, 87-98.

Silvestri L., Zanzi G.L., Gioia P., 2023. The Casal de' Pazzi Museum and the ancient "roots" of a territory: how to be included by being inclusive. In: Gioia P., Milli S., Silvestri L. (Eds.), 40 Years of Casal dé Pazzi in the Framework of Pleistocene Archeo-Paleontological Sites (400,000-40,000 BP): Current Knowledge and New Research Perspectives. Journal of Mediterranean Earth Sciences 15, Special Issue, 409-419.

Soriano S., Villa P., 2017. Early Levallois and the beginning of the Middle Paleolithic in central Italy. PLoS ONE 12(10), e0186082.

Taschini M., 1967. Il "protopontiniano" rissiano di Sedia del Diavolo e di Monte delle Gioie. Quaternaria 9, 301-319.

Tixier J., Inizan M.L., Roche H., 1980. Préhistoire de la pierre taillée_ 1. Terminologie et technologie. Nouvelles de l'Archéologie 8, 70-71.