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The Flintknapping Errors at the Service of Learning

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Introduction

The understanding of the management of natural resources by prehistoric man through an analysis of stone tools is useful to create parameters for the study of the level of manual skills and subsistence strategies in the Paleolithic. The flintknapping errors are helpful for recognizing novice flintknappers and, through the stigmata on the stone tools, the peculiarities of the theoretical and practical knowledge, of the manual skills ("knowledge and know-how", Harlacker, 2006), of the savoir-faire, which fit into the broader framework of the flintknapping learning process. The products with flintknapping errors are characterized by unintentional morphology precluding the functionality of the artifact itself. They are various, due to multiple factors, such as strong or inappropriate hammer strikes that generate different kinds of fractures, marked ripples, or specific flake morphologies that suggest a novice flintknapper. The experimental archaeology applied to the analysis of the lithic samples is useful to understand different features of the lithic technology. In this study are presented the results of a comparative analysis between experimental and archaeological samples coming from two different lithic complexes, Ca' Belvedere di Monte Poggiolo (FC) (Peretto et al., 1998) and Guado San Nicola 1 (IS) (Arzarello et al., 2009).
The first difference between this two sites concerns the context, both geographical and chronological. The site of Cà Belvedere di Monte Poggiolo (FC), situated in northern Italy, 15 km south-west of the town of Forlì (Emilia Romagna) was formed during the Plio-Pleistocene. The 4.3 meters stratigraphic sequence has allowed a detailed and precise dating of the site and the paleomagnetism shows that the site was occupied during a magnetic inversion phase that probably occurred before the Jaramillo period (Gagnepain et al., 1992). The last ESR data place the site of Monte Poggiolo in the late Matuyama around 1 Ma BP (Muttoni et al., 2010, 2011). The prehistoric population established near the mouth of the river exploiting the local raw material during a cold period (Cattani, 1992). The faunal remains as Mammuthus aff. meridionalis, Dicerorhinus sp., Bison cfr. Schoetensacki and Hippopotamus sp. (Giusberti, 1992) were found only near the site but not associated with the lithic remains.
The second site, Guado San Nicola 1 (IS), is a recent discovery. It's located in the South Italy, in the municipality of Monteroduni (Isernia, Molise), on the left side of Volturno river, 250 m.A.M.S.L., in a terraced alluvial deposit. There are 5 different stratigraphycal levels indentified, of which only two contain archaeological remains: a 70 cm. thick gravel level, delimited by an erosive surface and, above, a grey-green sands level, 50-80 cm thick. Besides the lithic remains, consisting in flakes, cores and bifaces, have been found also faunal remains as bison, horse, elephant and deer.

Materials and Methods

The methodology used consists in a comparison between archaeological and experimental samples. The study of the knapping errors of the lithic sample of Cà Belvedere di Montepoggiolo and Guado San Nicola 1 starts hence from an analysis of two experimental lithic samples.
The first sample comes from the Intensive Program Socrates Erasmus held in 2005 at C.E.R.P. (European Centre for Prehistoric Research), located in the town of Isernia (Molise, Italy). During this meeting, various knappers of different degree of experience, mostly beginners, followed different débitage methods: opportunistic débitage or SSDA (Forestier, 1993) by direct hard hammer percussion, finalized to obtain the maximum number of functional flakes, opportunistic débitage or SSDA by direct hard hammer percussion finalized to obtain elongated flakes and centripetal débitage by direct hard hammer percussion (Buonsanto, 2007).
The second example comes from the comparison of exercises carried out on the occasion of the exam "Technology, Use-wear analysis and Lithic Typology" by Master Degree students in Prehistoric Sciences, Master of Science in Quaternary, Prehistory and Archaeology students and Erasmus Mundus Master in Quaternary and Prehistory students.
The experimental collection was examined searching for a comparison, necessary for understanding the causes of the various knapping errors: the ability to analyze all the phases of the reduction sequence provides a clear vision of the

relationship between cause and effect, between gesture and result, between refined product and finished product.
The presence of mistakes in an archaeological record allows recognizing the presence of beginner flintknappers; hence the need of distinguish between error and accident arose. It was necessary to define the flintknapping error from the flintknapping accident: firstly, both are unexpected and not wanted. An accident is something unannounced that produces a different morphology precluding the stone-tool functionality (Baena, 1998); instead, the error term is used to highlight a feature found in the different phases of the learning process and therefore attributable to a beginner flintknapper (Shelley H. Phillip, 1990).
Indeed, the accident implies a chance that may happen to a skilled person in the act of following a process that he knows, and the error is due to inexperience and incompetence and happens to those who lack the skills to perform a particular action, therefore doing it in a wrong way. The distinction between accident and error allows understanding the causes related to the various mistakes recognized in a lithic assemblage, also in the ground of comparison between archaeological and experimental material.
Prior to the study of the Palaeolithic sites of Monte Poggiolo and Guado San Nicola, a classification of the different errors/accidents has been necessary, analyzing the data as much objectively as possible in order to understand the relationships of cause/effect of every described error. All the material underwent an initial review in order to highlight the only tools useful for the analysis, namely those in which it is possible to recognize the flintknapping errors. This initial review is also necessary for understanding all the phases of the reduction sequences and for finding possible refitting. The second step was recording the selected material in a specific database. In this way, it was possible to note the frequency of a mistake compared to one another, relate it to a specific débitage method or raw material and determine a precise phase of the reduction sequence. It is also important to understand if the mistake occurred because of the raw material or due to a lack of "savoir faire."

Results

Cà Belvedere di Monte Poggiolo

The analyzed specimens from the Lower Paleolithic site of Monte Poggiolo are 1319 (the complete archaeological record), consisting of flakes and cores, including 79 refitting. In particular, the refitting were very useful for understanding all the phases of the reduction sequence and for identifying the exact moment of the débitage in which the error occurred. The knapping techniques adopted are direct percussion by hard hammer and bipolar percussion, used for opening the spherical pebbles by split fracture. The exploitation of the pebbles was carried out using the unipolar, orthogonal, multidirectional and centripetal débitage methods. By analyzing the archaeological material and entering the collected data in a database, it was possible to discern the errors in 13.4% of the material of Monte Poggiolo; within this percentage just a third are cores, the remaining being flakes.
Primarily, we noticed that the first error a novice flintknapper may fall into, i.e. the choice of a poor quality raw material to be exploited, is almost non-existent: in fact, when a block of raw material with many inner defects and cracks is chosen, it is soon abandoned, otherwise after the split of one or two pieces, or if the core brakes into several pieces with the first and only shot. The latter situation often occurs: in fact, the pebble brakes with bipolar percussion thus only one shot is needed to see if the pebble is functional for proceeding with the débitage: in this case the products of fractured do not denote an "error" by the Paleolithic flintknapper, but a good knowledge of raw materials, not investing more energy to obtain not-functional products. Other types of errors/accidents have been reported (such as "languette" fractures, Siret accident, hinged and plunging flakes, double bulb, dihedral bulb, clean breaks), but in low percentages.

Guado San Nicola 1

The acheulean lithic assemblage of Guado San Nicola 1 consists of 5500 specimens with a stratigraphic attribution, 1909 specimens of which have also spatial coordinates. The artifacts found are flakes, cores and bifaces representing all the phases of the reduction sequence, from decortications to core abandonment: this is useful for recognizing the

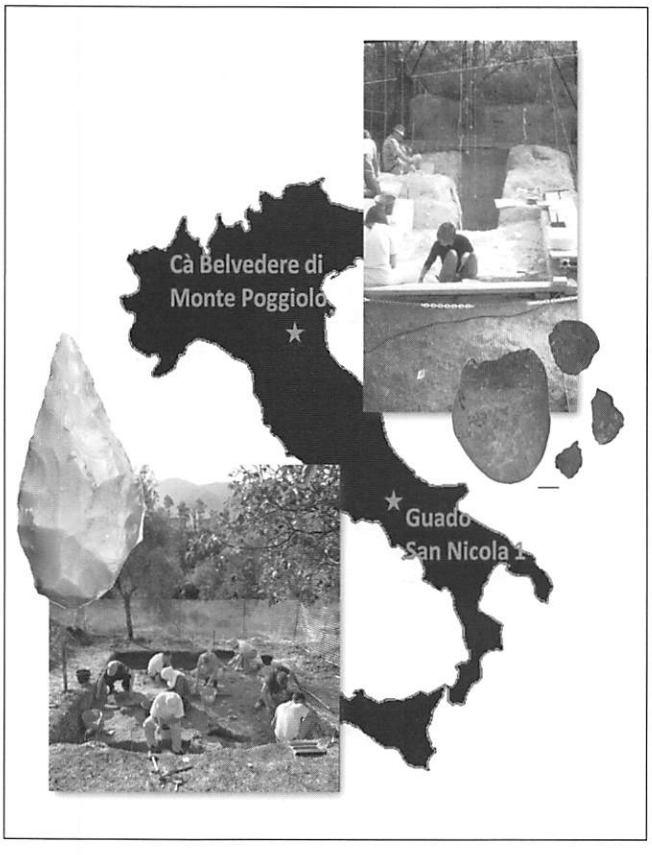

Fig. 1. *Location map of the sites of Cà Belvedere di Monte Poggiolo and Guado San Nicola 1.*

knapping techniques and methods adopted. The knapping technique adopted was the direct percussion by hard hammer for the débitage reduction sequence (unipolar, orthogonal, multidirectional, discoidal) and by soft hammer for the biface façonnage. The percentage of the errors found in the site of Guado San Nicola 1 is higher than the one in Monte Poggiolo: 17,5%. In this percentage, one fifth are cores and bifaces, the rest being flakes. The first important aspect is the different raw material used: the autochthonous one used in Guado San Nicola is full of cracking and imperfections, not homogeneous, coming from zones near the site with presence of outcrops as "Diaspro Varicolori" (even if some artifacts are made of some good silex coming from other sites allochtonous, for which the analysis is still in progress). Often, from the initial support, which is in most cases a plate, a single large irregular flake is derived, thick and not very functional, which can be considered as a detachment to test the plate and then used as a nucleus for an opportunistic débitage. Frequently, the flakes have clear breaks, which is not always correlated with the cracking of the raw material, but rather with an excessive strength hitting the core. The other errors / accidents, already listed in the site of Monte Poggiolo, were found in much larger quantities.

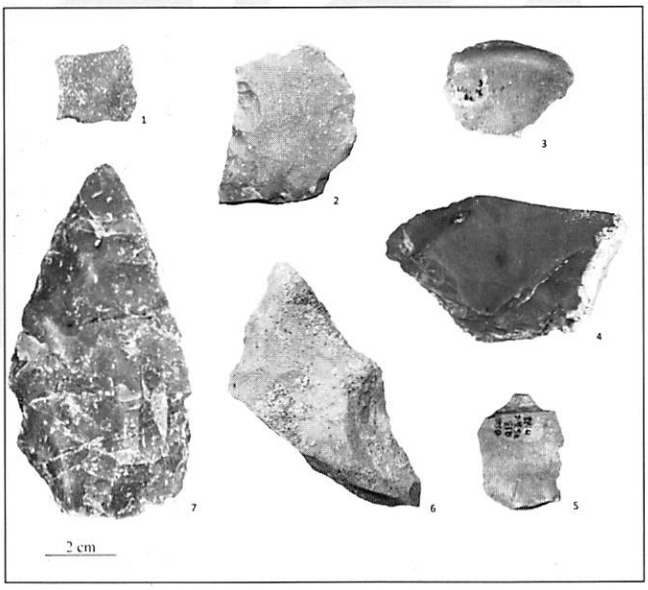

Fig. 3. *Examples of products with errors from the lithic complex of Guado San Nicola 1. 1) proximal fragment of flake, silex; 2) double bulb flake, silex; 3) plunging flake, silex; 4) flake with repeated strokes, silex; 5) "languette" fracture, silex; 6) biface with an oblique bending fracture, silex; 7) biface made of bad raw material (silex with natural breaks) but with an excellent façonnage and savoir faire.*

Discussion

The data collected through the comparison between archaeological and experimental collection lead to understand if the errors found in the lithic complexes of Cà Belvedere di Monte Poggiolo and Guado San Nicola 1 are due to a lack of savoir faire and manual skills rather than to a use of bad raw material. Some novice and inexperienced flintknappers'peculiar errors, such as hinged and plunging flakes (especially) are not so frequent to assert that within the lithic complex of Monte Poggiolo there could have been a component of inexperienced or novice flintknappers, and the few examples found are mainly due to a mismanagement of the exerted force in relation with the difficulty of using small pebbles for support. Thus, from a general analysis of the errors / accidents reported seems that in Monte Poggiolo the errors are not related to a lack of savoir faire, but rather to an accidental factor which falls within the normal percentage of accidents that may happen to an expert flintknapper as well.

Fig. 2. *Examples of products with errors from the lithic complex of Cà Belvedere di Monte Poggiolo. 1) debordant flake, silex; 2) double bulb flake, silex; 3) Siret accident: the flake, in silex, presents also a dihedral bulb; 4) hinged flake, silex; 5) flake in silex with a clean break, comtemporary to the débitage; 6) bad raw material (silex with natural breaks) and not-functional products: the pebble, despite its big dimension, is abandoned after obtaining only three flakes.*

With regards to the lithic complex of Guado San Nicola 1 it can be seen that the errors are not related to a lack of savoir faire, but rather to excessive strength in striking the cores, causing a large incidence of clear fractures. A very important data comes from the component of the lithic assemblage consisting in the bifaces, made in a wide variety of sizes and obtained with any type of raw material. It's in the manufacture of the bifaces that the savoir-faire and good manual skills of prehistoric flintknappers are evident: observing a good biface obtained with a poor and very easy to fracture silex, we discover a clear example of great capacity in the façonnage phase. Despite this, the bending fracture, a typical biface's fracture, is present in good proportions. Thus, it is possible to observe in this archaeological record a good experience in the flintknapping, but a manual coarseness.

In the both sites, it can be observed a good choice of raw material, often after testing it (Monte Poggiolo) and, where the raw material is not so homogeneous, a good management of it (Guado San Nicola).

The products show an excessive force in striking the core, but hence a good management of the convexities and of the products obtained, therefore it can be said that the prehistoric man had a good savoir faire in the flintknapping action and that it's not possible to say that some novice flintknappers where present as in Monte Poggiolo as in Guado San Nicola.
The important conclusion obtained from the analysis of these two Lower Paleolithic sites is that a bad raw material does not preclude the errors as well as a good management of the core doesn't exclude them.

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