GORTANIA
Geologia, Paleontologia, Paletnologia 33 (2011) 93-100 Udine, 29.X.2012 ISSN: 2038-0410

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EVIDENCE OF GRAVETTIAN FREQUENTATION AROUND 30KY BP AT THE FOOT OF THE FRIULIAN DOLOMITES

EVIDENZA DI FREQUENTAZIONE GRAVETTIANA ATTORNO A 30MILA ANNI FA AI PIEDI DELLE DOLOMITE FRIULANE

Riassunto breve - Una nuova grotta è stata scoperta nella regione nord-adriatica al confine tra le Alpi italiane e la Pianura Friulana. La successione stratigrafica ha restituito evidenza di frequentazioni effimere durante il Gravettiano antico, un tecnocomplesso individuato per la prima volta in questa zona d'Italia. In base alle caratteristiche litologiche e alla composizione tipologica dell'insieme litico, è stato possibile inferire che i gruppi umani arrivavano in grotta equipaggiati di strumenti ed armature venatorie confezionati altrove.
Parole chiave: Paleolitico Superiore, Industria litica, Date al radiocarbonio, Grotta, Pianura Nord-Adriatica.

Abstract - *A new cave recently investigated has come to light in the Northern Adriatic region at the border between the Italian Alps and the Friulian Plain. Its multi-layered archaeological content has recently provided unexpected evidence of ephemeral frequentation during the early Gravettian, which is recorded for the first time in this part of Italy. Given the lithological and typological composition of the assemblage, it has been inferred that humans entered the cave already equipped with tools and hunting implements.*
Key words: *Upper Paleolithic, Lithic tools, Radiocarbon dates, Cave, North Adriatic Plain.*

Introduction

In the extreme Northern Adriatic region, the Gravettian is unknown, contrary to the Venetian pre-alpine belt and, to the East, the Drava Basin (Broglio, 1994). In these contexts, sites are placed at variable distance from the flint outcrops and are characterized by short-term and ephemeral frequentations, utilized as logistical stops along seasonal routes. At the bottom of the Carnic and Julian Pre-Alps, the evidence was scarce until the discovery of Grotta Rio Secco, a large cave first explored in 2002.

Landscape setting

Grotta Rio Secco is situated at an elevation of 580 m on the Pradis Plateau in the eastern part of the Carnic Pre-Alps, an orographic system with a dissection from N-S and W-E oriented valleys separated from peaks 2000-2300 m high. The plateau is almost 6 sq. km large and raises from 530 m to 590 m. It is enclosed on three sides by mountains peaking from 1148 m to 1369 m and to the south it bounds over the foothills crossed by the Cosa stream. From its northeastern side it is possible to enter the narrow Arzino Stream valley, a tributary of the Tagliamento river flowing north-southward. To the west, the Chiarzò stream valley is connected to the Tramontina Valley. To the south, the plateau faces the present-day Friulian plain, which is the uppermost belt of a large lowland, the Great Adriatic Plain, emerged during the late Pleistocene and had its extension peack southward during the Last Glacial Maximum (Shackleton et al. 1984). Due to its geographic setting between the Plain and the Pre-Alps, the Pradis Plateau stands at a strategic position, which may have facilitated human infiltration into the alpine region and the upper Tagliamento basin.

The Pradis Plateau is a gentle undulating landscape deriving mainly from the low dipping of the Cretaceous carbonate formations (Rudist Limestone and Scaglia Rossa) and partly from Flysch over one third of the total surface (De Nardo 1999). Where the Flysch permeates the substrate, it supports the formation of a surface hydrographical system, resulting in a landscape with typical fluvial features such as valleys, terraced surfaces and thin alluvial sheets. The limestone bedrock, affected by karst degradation processes, is producing an uneven microtopography with isolated blocks, bratices and large dolines, lined up along main fractures or tectonic discontinuities. The bedrock is permeated by a dense system of more than 200 explored cavities,

some of which penetrate several kilometers deep and vary in altitude by a few dozen meters (Cucchi & Finocchiaro 1981). The Cosa and Rio Secco waterways dissecting the plateau run through the bottom of deep and narrow gorges and originated from a combination of tectonic uplift with karst and run-off erosion processes. Along these gorges, several shelters and caves were formed in the walls and many others at the base of rock walls when large dolines collapsed. Only few of them have been explored for the presence of Pleistocene fills and yielded Mousterian (Grotte Verdi) and late Epigravettian evidence for human presence (Grotte Verdi, Grotta del Clusantin; Bartolomei et al. 1977; Corai 1980).

The Cave and the late Pleistocene Sedimentary Sequence

Grotta Rio Secco is a large sheltered cave opening on the left slope of the stream gorge, ca. 20 m above the present-day stream. Facing south, the shelter has a wide and flat roof derived from the collapse of large slabs of the stratified limestone (fig.1). The sheltered area is bordered from the outside by a large ridge of big boulders used in the recent past to delimitate a large recovery. The cave is not active, it opens in the middle of the wall, and continues as a gallery heading for 12 m until the sediments completely fill up. Outside, the fill forms a slope-waste deposit thickening along the present-day drip line where the big boulders define the original extension of a vast roof.

The relevance of Rio Secco as a potential prehistoric settlement arose during summer 2002 when a test pit (GRS I) exposed a group of layers with Mousterian lithic artifacts and faunal remains dated to 42.2 Ky cal. BP (Peresani & Gurioli 2007). On the base of this record, a middle-term exploration project was implemented in 2010 and a first field campaign started, followed by a second one in September 2011. At first, a 3x7 m large sector was opened in front of the cave and successively narrowed according to the stratigraphy, the archeological evidence and the stability of the sections. The area currently explored is in proximity of the eastern rock wall, 6 m from the present-day drip line. After the reworked sediment in the back of the cave had been removed, the top of the Pleistocene fill became exposed, such as the traces of an antecedent unauthorized excavation in the south-eastern sector of the tunnel.

Fig. 1 - A view of Rio Secco: the cave before the start of the excavation in 2010.
- *Grotta del Rio Secco (PN). Immagine della Grotta del Rio Secco prima dell'inizio degli scavi nel 2010.*

Fig. 2 - Longitudinal section opened showing the sediments of the macro-unit BR1 (layer 4), layer 6 and the large boulders of macro-unit BR2.
- *Sezione stratigrafica longitudinale aperta con esposti i sedimenti della macro-unità BR1 (strato 4), del livello 6 e i massi della macro-unità BR2.*

The cave is filled by an assortment of sedimentary bodies of different shape, composition and origin, composing a 2.60 m thick sequence so far, which is the depth of the section exposed at the bottom of the 2010 pit. These sedimentary materials have been grouped into five macro-stratigraphic units separated by erosional and sedimentary discontinuities with variable shape and spatial arrangement. Each macro-unit can contain more than one single stratigraphic unit or layer progressively numbered. From the top, the macro-units are 1, BR1, BR2, Bio1 and layer 8. Of these, the macro-unit BR1 (named layer 4 on the field) includes layer 6, an anthropic layer with Upper Palaeolithic artifacts. Macro-unit Bio1 and layer 8 produced Middle Paleolithic evidence (Peresani et al. 2011, 2012, in prep.). The most relevant features are the presence of stones, varying discontinuously from high to very high due to the degradation of boulders and local rockfall, and the fine fraction sediment particles and stones (<5cm), which prevail over the coarse-grained sediments with a ratio of 3 to 1. The boundary with macro-unit BR2, a massive open-work stone-supported breccia is abrupt, as underlined by the clear predominance of the stone. The dark, anthropic layer with organic matter and microcharcoal has been exposed below the rockshelter over 4 sqm, approximately 20 cm above the top of BR2 (fig. 2): it is thin, planar, and discontinuous and contains rare bones and lithics. It is interjected by bio-tunnels which have displaced portions of the sediment. Nevertheless, at the entrance of the cave, it is better preserved and thickens as can be seen on the section cut by unauthorized excavations. The fabric of layer 6 sometimes shows alternation of lenses of different color (grayish-brownish to grayish) with size-selected stones, folded with the inclination of lower boundary dipping. In the squares where this layer is absent, the sediment has been removed according to the artificial spits (from a to f) used for excavating layer 4. Layer 6 correlates with cuts 4c and 4d.

Hearths

Layer 6 contained two hearths partially affected by post-depositional disturbances, labeled as US6_SI and US6_SII.

Hearth US6_SI. It consists of an agglomerate of charcoals which are mostly disaggregated, around a large piece of charred wood which lay on a thin level

Fig. 3 - The remnant of the fire-place US6_SII.
- *I resti del focolare US6_SII.*

Context	Lab. Ref.	^{14}C age BP	Cal. age BP
6, sq.J11, n.3	Poz-41207	27080±230	31466-31205
6, sq.J11, n.4	Poz-41208	28300±260	33022-32138

Tab. I - AMS Radiocarbon ages of charcoal (Ch) from Rio Secco Cave. All dates are from single fragments topographically positioned and archived. Pre-treatment method of the samples was ABA. Calibration at 68.2% confidence has been generated using the Oxcal computer program (v4.1) of C. Bronk Ramsey, using the "INTCAL09" dataset (Reimer et al. 2009).
- *Età al radiocarbonio AMS su carboni (Ch) prelevati dalla Grotta del Rio Secco. Le date sono state ottenute da singoli frammenti di carbone registrati topograficamente. Il metodo di pre-trattamento del campione utilizzato è l'ABA. La calibrazione con grado di affidabilità del 68,2% è stata effettuata utilizzando il programma Oxcal (v4.1) di C. Bronk Ramsey, usando il dataset "INTCAL09" (Reimer et al. 2009).*

of small stones and few smoothed clasts (fig. 2). This hearth is cut from the unauthorized excavation in the back of the cave and from a biogallery. The traces of ash are lacking, but there is a thin reddened horizon below the level of charcoals. A bone of beaver (*Castor* sp.) with no traces of anthropic modification has been found in proximity of the hearth (M. Romandini and N. Nannini pers. comm.).

Hearth US6_SII. This is a small agglomeration of charcoal largely disturbed by several interlaced burrows. In the middle, a reddened horizon with high concentrations of charcoal has been observed. Post-depositional disturbance devaluated possible scatters of bones or flints.

Radiocarbon dates

Two tiny pieces of charred wood have been collected in layer 6 from a single square and have provided ages of 33,0-32,1 Ky B.P. and 31,5-31,2 Ky B.P. spaced at minima of few hundred years (tab. I). Noth the dates place the human presence in the Early Gravettian.

Faunal remains

Every stratigraphic unit contained animal bone remains. Numerous bones come from the reworked

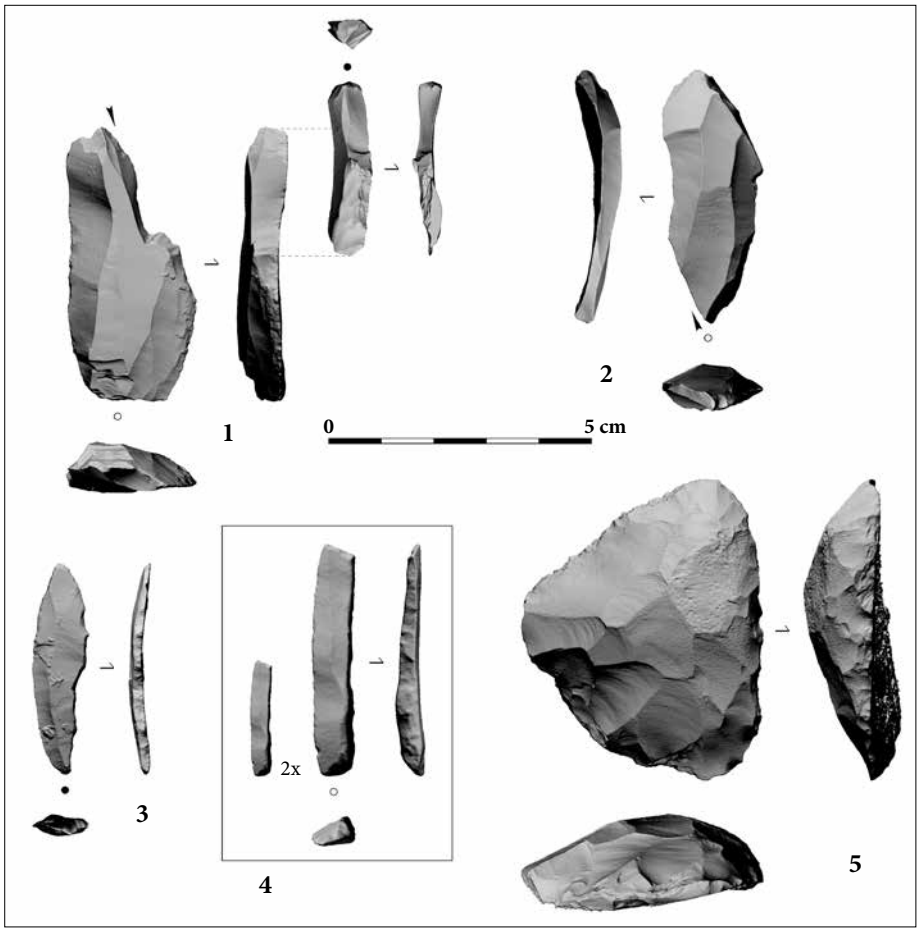

Fig. 4 - Gravettian implements. 1-2, burins, also with a refitted burin spall; 3, unfinished backed point; 4, double truncated backed bladelet; 5, end-scraper on large retouched flake (3D scanning).
- *Strumenti gravettiani. 1-2, bulini e nuclei-buliniformi, anche con rimontaggio di una lamella; 3, punta a dorso non finita; 4, lamella a dorso e doppia troncatura; 5, grattatoio su scheggia larga ritoccata (scansioni 3D dei reperti).*

sediment and present different ages and degrees of preservation. Other bones found in the macro-units 1, BR1 and BR2 will not be considered in this work because they are of limited paleontological relevance due to their provenance from sediments reworked from burrowing. The colonization of the cave fill by burrowing animals (*Marmota marmota*) is in fact clearly documented by diagnostic signatures observed in BR1 and BR2, such as dens, chambers and anatomically connected skeletons. As regards the Gravettian, the faunal remains are few, represented by ibex, chamois and beaver bones.

The lithic implements

In addition to charcoals and fire-places, the archaeological contents of layer 6 and of the artifical spits from 4a to 4d are also represented by lithic artifacts showing fairly well preserved flake edges.

Regarding the provenance of flint, the Venetian and the Carnic Pre-Alps contain potentially exploitable sources in carbonatic-dolomites and limestones from the Upper Triassic to Miocene (Carulli et al. 2000) with variable chert content. Flint abounds in the Soverzene Formation, the Verzegnis Encrinites, the Igne Formation, the Vajont Limestone, the Fonzaso Formation, the Maiolica micritic limestones, the Soccher Limestone and its bioclastic carbonatic sandstones, the Scaglia Variegata, the Scaglia Rossa and its red nodular flint locally present. About 20 km from the site in northern direction, there are exposures of micritic and bioclastic limestone of the Livinallongo Formation with flint beds and nodules typically colored green. In spite of such relative abundance and their suitability for flaking, these variably textured pre-alpine flints were not intensively exploited due to poor accessibility to the primary exposures, which are scattered on the highest mountain ridges and far from the main rivers and the intense fissuration caused by the tectonic activity. Loose river (Tagliamento) and stream gravel beds (Meduna, Arzino) supply coarse pebbles and smoothed cobbles, in addition to conglomerates, glacial and fluvioglacial deposits.

The Gravettian finds are few lithic artifacts, mostly coming from the artificial spits a, c and d and, to a lesser extent, layer 6. Raw materials are different by comparison with the Mousterian assemblages: with the exception of 5 undetermined pieces, the Maiolica flints are the most represented (8), followed by Scaglia Rossa (3), Verzegnis Encrinites (3), Soverzene (2), Scaglia Variegata (1), Igne (1) and Eocene flint (1). Technologically, the assemblage is characterized by blade / bladelet production. Related pieces are rejuvenation flakes of core striking platforms, and of core face and fragmentary blades. The most significant tools are

three burins on truncation (2 made of Maiolica and 1 of Verzegnis Encrinites flint) made on blades and on rejuvenation blades. One of them shows negatives of several burin spalls, of which one was refitted and for this reason should be intepreted like bladelet-core. In addition, there are two endscrapers produced on cortical flakes of Verzegnis Encrinites flint, one of which is thick and large. Among the armatures, we count three baked pieces (2 on Maiolica and 1 on Scaglia Rossa flint): one backed bi-truncated bladelet, one unfinished backed point and one undeterminable fragment (fig. 4). Other pieces have been found in reworked sediments. Given their typo-technological features, they can be considered as a proxy evidence to be added to the pieces recovered from more reliable context: one bidirectional bladelet core with two facetted opposed striking platforms, a single surface being exploited by several short reduction sequences; a semi-cortical blade on Scaglia Variegata detached using soft hammer percussion.

Considerations

The Rio Secco Cave is in many aspects a site with an undeniable potential for the reconstruction of human occupation in the north-Adriatic Plain during the MIS 3 phase, and should therefore be placed in a wider geographic and ecological context of human population. The Gravettian frequentation is eve more scarce than the Mousterian one (Peresani et al. in preparation), probably due to very ephemeral visits to the cave. Nevertheless, already at the current state of investigation the few flint artifacts give economic hints of potential interest. The backed pieces and the burins introduced onto the site and reduced for rejuvenation or for the extraction of bladelets are expression of short-term occupations by hunter-gatherers equipped with retouched tools made of high quality flints collected outside the Carnic Pre-Alps. The Gravettian frequentations fall in GI5, almost two millennia before the lower boundary of the LGM at 29 ka cal BP (Lambeck et al. 2002; Shackleton et al. 2004). In this region, the building phases of the Tagliamento glacial amphitheatre (Monegato et al. 2007) correlate with the replacement of peat-forming grass vegetation by xerophytic herbs and shrubs of dry steppe in the Azzano X core (Pini et al. 2009), although conifer trees and shrubs persisted in the foreland, though in reduced stands.

This documentation of an initial phase of the Gravettian is a rare occurrence around the Adriatic slope of the Italian Peninsula. Currently, Grotta Paglicci in southern Italy provides the best known context, where the early Gravettian of the layers 23 and 22 is dated from 28.3 to 26.8 ky ^{14}C (Palma di Cesnola 1993). The two Gravettian assemblages include burins mostly of simple type, end-scrapers and other common tools as well as a bulk of Gravettes, microgravettes and other backed points, among them possible fragments of *fléchettes* (Borgia 2008; Palma di Cesnola 2004). To the north, near the boundary of the Great Adriatic Plain, the Gravettian is recorded only in the Berici Mounts, at Grotta del Broion to be precise, where the human settlement dates few millennia later than Rio Secco (Broglio & Improta 1994-5), and at Riparo del Broion, where the levels 1b and 1bα have been dated to 27.9 and 28.5 ka ^{14}C BP (De Stefani et al. 2005). This shelter produced signatures of a marginal settlement used for hunting tasks, as inferred from the scarce end-scrapers and burins and the several backed implements like points, frequently affected by impact fractures (De Stefani et al. 2005).

The absence of Gravettian settlements in the Eastern Alps and along the Drava and Sava basins may reflect a research bias rather than a gap in human presence. To the north-west along the Danube Basin and its tributaries in Central Europe, the sites of Willendorf II, Pavlov I and Dolni Vestonice II and I record Early Gravettian occurrences chronologically consistent with Grotta del Rio Secco (Djindjian et al. 1999).

Manuscript received on 20.X.2012, accepted on 27.X.2012.

Acknowledgments

The 2010-2012 Grotta Rio Secco research project has been promoted by the Administration of the Clauzetto Municipality and coordinated by the University of Ferrara after concession of the Archaeological Superintendency of the Friuli-Venezia Giulia. M.Peresani plans research and directs the fieldwork, M. Romandini coordinates the fieldwork. Rio Secco project is also co-designed by the Neanderthal Museum (A. Pastoors & G.-C. Weniger) and the Universitat Rovira y Virgili at Tarragona (M. Vaquero). The financial support is warranted by a group of public institutions (Ecomuseo delle Dolomiti Friulane "Lis Aganis", Consorzio dei Comuni del Bacino Imbrifero Montano del Tagliamento, Provincia di Pordenone), Foundations (Fondazione Cassa di Risparmio di Udine e Pordenone) and private companies (Buzzi Unicem Spa, Emilio Bulfon winegrowers, Fantinel winegrovers). The logistic assistance was furnished by the Clauzetto Public Administration. The authors are grateful to the Gruppo Culturale Pradis for support to the fieldwork, to all students of the Ferrara University and collaborators who took part in the excavations. A thank goes to S. Talamo, Max-Planck Institute for Evolutionary Anthropology, for advices in the calibration of radiocarbon dates.

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