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# The Copper Age jasper quarry of Valle Lagorara within the longer history of the valley (Italy)<sup>1</sup>

### Abstract

This paper presents the results of a ten years research in Valle Lagorara. The valley is located in the Apennine mountains between Genoa and La Spezia (Italy). The major visible archaeological feature of the site is a large jasper quarry exploited during the Copper and Early Bronze Ages. The surfaces of the outcrop preserve two main areas where many imprints of extraction hammering are visible. More than 300 m<sup>3</sup> of raw material were quarried. The rock was almost exclusively processed in the valley (two workshops have been investigated) with a standardised chaîne opératoire, in order to produce bifacial specimens.

The excavations also investigated earlier and later deposits, which cover a wide time span, from the Mesolithic to the Middle Ages, allowing us to fit the jasper exploitation within a longer history of human occupation and transformation of the area.

**Keywords:** Bifacial artefacts, collective burial, Copper Age, flat-rough retouch, jasper, ogive, quarry.

Liguria is a rugged, arc-shaped region facing the northern Tyrrhenian Sea. The abundance of caves concentrated around Finale Ligure, in the western part of the region, attracted Neolithic people who left many remains there. However the general morphology of the region was not favourable to the Neolithic economy and indeed Eastern Liguria has yielded very few Neolithic traces, suggesting that the Neolithic population was relatively low in this part of the region. This was true at least until the beginning of the Late Neolithic (4300-4200 BC), when the introduction of a mobile pastoral economy made the mountains and the pastures more attractive and provided resources that shepherds were able to increase by fire clearing (Maggi & Nisbet 1991). This new way of exploiting the vegetal resources of the territory was successful, as is shown by the sharp increase in sites during the following Copper Age. In this context the local copper ores have also been exploited from the very beginning of the Copper Age, as is shown by the radiocarbon dates from the recent excavation of the Monte Loreto copper mine (Campana *et al.* 1999; 2001; Maggi & Pearce in press; the oldest date: 4720±60 BP = 3645-3355 BC – in this publication all radiocarbon dates are presented as uncalibrated BP years and calibrated to 2 sigma). These economic factors are to be considered the principal reasons for the regional sharp increase in the population from the Early Copper Age. The demand for siliceous rock for the chipped stone industry increased therefore correspondingly.

The Copper Age is also the period when bifacial flat-retouched artefacts, mainly arrowheads, became very popular. Thus the need for siliceous rock increased in such a way that the suitability for bifacial chipping became one of the factors on which choice was based.

Red jasper (radiolarite) is widespread in Eastern Liguria and had been used since the Middle Palaeolithic; however, the blade-chippers of the Mesolithic and Neolithic communities put more effort into searching for flints other than the local jasper (Maggi & Garibaldi 1986). Preferences switched back to jasper with the bifacial, flat-retouched industry of the Copper Age. At this stage, because of the rise in population, it appears that river and beach sources were no longer sufficient. Attention was therefore paid to primary outcrops, such as the Valle Lagorara.

# Valle Lagorara: the quarrying and workshop areas

The small Lagorara valley is located in the heart of the Eastern Ligurian Apennines about 60 km east of Genoa. The valley is incised along the contact between the clay



Fig. 1: Topographic map of the Lagorara valley showing the archaeological areas (plan Aran Progetti s.n.c. - Genova).

Fig. 2: Winter view of the jasper outcrop of the western side of Mount Scogliera (988 m a.s.l.). To the right Rocca di Lagorara (770 m a.s.l.), where the LG3 quarrying area is located, to the left the LG1 area. The arrow indicates the "Grotta del Bandito" Cave. It opens in the limestone formation overlying the jasper toward the top of Monte Scogliera. The conical dumps at the bottom of LG1 and LG3 preserve abundant archaeological remains of the extraction and primary chipping activities.



schist formation to the west and the jasper formation of Scogliera Mountain to the east (Fig. 1).

The jasper outcrop of the western slope of the Mount Scogliera is massively exposed to around 200 m in thickness, forming an almost vertical cliff. It is constituted by a continuous sequence of thousands of layers of red jasper, varying from about 5 to about 20 cm in thickness. Many are homogeneous, with a high siliceous content and few micro-fractures – thus providing a rock well suited for flaking.

The jasper of this outcrop was widely exploited by prehistoric communities. In fact scars (close and rather continuous concoidal fractures) of the hammering of quarry slabs are visible over large areas of the outcrop.

Since jasper is a very siliceous hard rock, which is little or nothing susceptible to weathering, wide parts of the quarry surfaces are still as they were at the moment when they were abandoned by prehistoric quarrymen around 4000 years ago.

Two main quarrying areas have been recognised, where the traces of prehistoric hammering are concentrated, namely LG1 and LG3. They correspond to the zone where the rock is of better quality (in terms of suitability for flaking). They are separated by a gorge, where the jasper is heavily fractured and has a lower siliceous concentration (Fig. 1-2).

Quarrying strategies varied according to the strike of the source siliceous layer. In the case of vertical/sub-vertical layering, the most common technique consisted of demolishing the succession of layers by hard hammering. Conical recesses a few metres wide, obtained by this technique, are easily recognisable on the cliff surface (Fig. 3). The largest have small ledges and terraces where small deposits accumulated, almost exclusively made out of jasper waste flakes plus fragments of hammerstones.

Hundred of tons of debris, waste flakes, unfinished artefacts, exhausted hammerstones and fragments of hammerstones (Fig. 8.5) are embedded in the conoid that lies at the bottom of the exploited outcrops (Fig. 2).

Our study showed that chipped artefacts are dispersed over three main areas (LG1, LG2 and LG3) (Fig. 3), totalling altogether 31,000 m<sup>2</sup>, while archaeological deposits cover an area of not less than 3000 m<sup>2</sup>. In seven excavation seasons we were able to investigate less than 2% of the estimated volume of the archaeological deposit. This produced almost 3000 kg of artefacts, which have been transported to the Chiavari Archaeological Museum for study.

A few hundred metres to the North, on the opposite side of the valley, there are some river terraces near the con-



Fig. 3: One of the quarrying niches of the LG1 area.

tact between the schists and the "Calpionelle" limestone formations. A few large boulders of jasper, the result of ancient (possibly Early Holocene) rock-falls, have created a number of rock-shelters, two of which (LG2A and LG2B) have been investigated.

The stratigraphy of these two shelters yielded a large quantity of waste flakes, several hundreds flat-rough artefacts, a few fragments of pottery, soapstone beads and soapstone pendants, a piece of grinding stone, two firestones, and two fragments of smelting slag (Fig. 6). The faunal remains have been destroyed by the acidity of the soil (Maggi *et al.* 1994; Maggi *et al.* 1995).

# The long history of Valle Lagorara

The jasper quarry is the major visible archaeological feature left in the valley. However the excavation investigated both earlier and later deposits, which allow us to fit the jasper exploitation within a longer history of human occupation and transformation of the area.

While the Mesolithic evidence is scanty, Neolithic people left rather more traces, as shown by a small cave called "Grotta del Bandito" and by the stratigraphy of the LG2A rock-shelter (Fig. 4 and 5).

The Grotta del Bandito yielded:

1. evidence of possible Middle Neolithic burning of the woodlands (in order to obtain more pasture for domestic herbivores),

2. a Middle-Late Neolithic collective burial (which perhaps is the earliest example in north-west Italy of collective burial in a small natural cave, a practice that will become very popular during the Copper Age).

The LG2A rock-shelter preserves a basal micro-laminated peat sediment, accumulated during the Early Neolithic (layer 12:  $6730\pm50$  BP = 5680-5500 BC and  $6360\pm60$  BP = 5440-5210 BC). Palynological analysis provides some indirect indication of human disturbance of the mosaic of



Fig. 4: South rock-shelter (LG2A) – section H-I/1-3; the dark mark shows the location of the palynological column sample; the layers with high flake densities (u.s. 6b, u.s.6c) are further left.

open evergreen and deciduous woodland and scrubland that grew in the surrounding areas during this period.

The bog was then buried by a silty-clay colluvial sediment of Late Neolithic age (layer 11:  $5380\pm70$  BP = 4440-3990BC and  $5010\pm50$  BP = 3960-3670 BC). A few pieces of charcoal indicate the lighting of anthropogenic fires. The latest is dated to  $5010\pm50$  BP and is associated with a few jasper flakes. This dates the small-scale beginning of the exploitation of the local jasper. None of the earlier data suggest any evidence of exploitation before this time.

The picture that emerges is therefore the Neolithic people, probably shepherds, were interested in the vegetal resources of the valley, but not in its jasper outcrop.

Besides the use of the local jasper attested by the flakes found in LG2A us 11, more substantial exploitation of the Valle Lagorara raw material is indicated by layer 13 of LG2E, dated  $4830\pm50$  BP (3710-3505 BC), at the very beginning of the local Copper Age.

From then on, jasper exploitation became more and more impressive. In fact, the shape of the quarried areas allows us to estimate that up to 2000 tons of rock were hammered

out by the prehistoric quarrymen. Twelve stratigraphic units generated by quarrying and related activities have so far been radiocarbon dated (Fig. 5). They place the jasper exploitation in a period that spans from the very beginning of the local Copper Age ( $4830\pm50$  BP = 3710-3505 BC) to the Early Bronze Age ( $3650\pm70$  BP = 2200-1770 BC).

The indication that the quarrying ended during or near the end of the Early Bronze Age is corroborated by a bronze disc-head pin found at the top of one of the stratigraphic series. Such pins are known from several contexts from Northern and Central Italy, mainly dating to the late Early Bronze Age (18<sup>th</sup>-17<sup>th</sup> century BC).

It may be observed that 11 out of 12 dates are Copper Age (given the regional chronology of the Copper Age as being between 3600-2200 BC: Maggi 1998). It therefore seems most probable that most of the exploitation occurred during the Copper Age, probably during its earlier phases, as suggested by eight dates earlier than 4300 BP.

Only one of the excavated layers can be assigned to the Early Bronze Age period, layer 4 of the East rock-shelter (LG2B). A piece of *quercus* charcoal stuck to a typological Early Bronze Age pottery fragment from this layer provided



Fig. 5: Valle Lagorara (LG) and Grotta del Bandito (TBAND): diagram of the cal BC dates (2 sigma).

an AMS radiocarbon date 3650±70 BP (2200-1770 BC). It is interesting to note that this layer yielded more pottery and steatite objects (Fig. 6) than any of the Copper Age layers. This suggests that during the Early Bronze Age people were using the site in a slightly different way than in the preceding period. Most of the steatite objects had been abandoned at different stages of the manufacturing process. Indeed, the excavation of the Early Bronze Age layer of the East rock-shelter (LG2B) yielded evidence for a soapstone workshop. Soapstone artefacts are widespread in eastern Ligurian prehistory. A major Copper Age (Bell Beaker) and Bronze Age steatite workshop is known from Pianaccia di Suvero (Gernone & Maggi 1998), where northern European amber pendants were copied into soapstone (Chella & Gernone 1998). There are two soapstone outcrops in Valle Lagorara, one of them very close to the site (Fig. 2). However the on-site production seems to have been of local interest only.

#### **Chipped artefacts**

The most significant artefacts from the site are bifacial specimens with flat-rough retouch (Fig. 7).

The frequency of these specimens (almost 1800, most of them from the rock-shelters, but many also from the quarry

area) versus the other types of retouched artefacts is very high. This suggests that the chipping activity carried out at the site was strongly oriented to the manufacturing of such items.

An analysis, supported by an experimental reproduction, has been effected of both the bifacial flat-rough artefacts and the unretouched flakes (Negrino 1998). This study indicates that the bifacial flat-rough artefacts are the discards of a well standardised *chaîne opératoire*, aimed at producing "ogives". By "ogives" we mean artefacts with an ogival shape, often pointed, with a bi-convex-longitudinal and transversal cross-section, characterised by bifacial, flat and often invasive retouch.

The primary chipping of the blanks produced polygonal/ ogival-like artefacts with a rough retouch (preforms 1), using a hard hammerstone (Fig. 8); experimental reproduction (Briois & Negrino 2002) has shown that for this stage only one to two minutes of work are necessary. The following stage was to reduce the preform 1 in order to obtain thinner and more regular bifaces (preform 2). This stage was the most delicate of the whole *chaîne opératoire*, since the reduction of thickness produced many transversal fractures, generated by the blows aimed perpendicularly to the longer axis of the piece. In this stage smaller hammer-

Fig. 6: 1,2,4 cylindrical (from LG2A), discoidal (from LG2A) and biconical (LG1H) soapstone beads; 3 soapstone pendant at early stage of manufacturing (LG2B); 5 firestone? from LG2A; 6 chisel from LG2A (drawings by P. Chella & F. Negrino).





Fig. 7: 1-2 unfinished arrowheads from LG2A; 3 an "ogive" discarded during the chipping of the tang (from LG2A); 4-5 a complete ogive (from LG2A) and a broken one (from LG2B); 6 a preform of phase 1 (preform 1) from LG1B; 7 a pick from LG2A (drawings by F. Negrino).

stones, weighing about 100-300 g, were used. They were of igneous rock or siliceous limestone.

The finishing of the "ogives" represents the last phase of production. The ogives were probably chipped using small hammers of a soft stone, such as limestone. Experimental reproduction indicates that the manufacture of an ogive takes about 20 minutes.

Typometrical diagrams (Fig. 9) show that there is a progressive cluster of curves from the roughout specimens (preform 1) to the more refined ogives. This seems to indicate that the aim was to obtain artefacts (ogives) of 6 cm in length, 4 cm in width, 2 cm in thickness and 20-30 g in weight. The ogives were the best preform for the chipping of fine, bi-convex, well-balanced arrowheads. Wear analyses (Voytek 2002) of all of the bifacial flatrough specimens show only occasional occurrence of use-wear. Moreover the scarce evidence of use-wear so far recognised is not at all systematic (not repetitive), suggesting that some of the flat-rough artefacts had been used occasionally, from time to time, as expedient tools. This corroborates the hypothesis that most, if not all, the bifaces are pieces that were discarded because of some cracks caused during the *chaîne opératoire*.

In fact all the data recovered so far suggest that only small-scale subsistence activity occurred on site during the Copper Age. It seems therefore that by far the main goal of people visiting Valle Lagorara was the exploitation of jasper and that any subsistence activity was to support this practice. If confirmed, this should mean that jasper



Fig. 8: 1 limestone, 2 feldspar, 3-4 gabbro and 5 meta-ox-diorite hammerstones; 6 number of hammerstones fragments according to weight and provenience (LG1-LG3: quarrying areas; LG2: workshop area) (drawings by F. Negrino & L. Rando).

quarrying was by this time a somewhat specialised activity. The experimental work suggests that an average of 200 g of rock were exploited for each arrowhead produced. If the final goal of those exploiting rock from Valle Lagorara was exclusively to produce arrowheads, then the *c*. 2000 tons of rock exploited were sufficient to chip out ten million arrowheads – an average of some 5,000 arrowheads for each of the 2000 years of jasper exploitation. If the yearly average consumption of arrowheads was ten per person, Valle Lagorara provided enough arrowheads for 250/500 people – which is perhaps about 1/10 of the possible estimated population of Eastern Liguria.

# After the quarry

The abandonment of the quarry after the Early Bronze Age fits the regional archaeological picture. In fact there

is evidence of a major change in the way of life from the Middle Bronze Age, including the material culture, burials (the introduction of cremation) and the dynamics of settlement.

In this context the chipped stone industry practically disappeared, and only a few rough items have been found in the post Early Bronze Age deposits.

The Valle Lagorara thus ceased to be an important source of lithic raw material and returned to shepherds. Evidence of agro-pastoral exploitation is preserved in the "post quarrying" archaeological deposits, which provide indicators of woodland management by fire. Two main phases of agro-pastoral activity date to the Iron Age and to the Late Roman - Early Middle Ages.



Fig. 9: a length, width and thickness of the preforms of phase 1; b of the preforms of phase 2; c of the ogives; d weight of the preforms of phase 1, 2 and of the ogives.

#### Acknowledgements

The authors thank Mark Pearce for cheking their English.

#### Note

After this paper was submitted for the proceedings of the VIII Flint Symposium, a monograph about the site has been pub-lished by Istituto Italiano di Preistoria e Protostoria (I.I.P.P.): Campana, N. & Maggi, R. (eds.), Archeologia in Valle Lagorara: Diecimila anni di storia intorno ad una cava di diaspro, Origines, Firenze. All the data in the present paper are extracted from that publication.

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