EXCAVATIONS AT THE HIGH ALTITUDE MESOLITHIC SITE OF LAGHETTI DEL CRESTOSO (BOVEGNO, BRESCIA - NORTHERN ITALY)

edited by
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CATERINA OTTOMANO, ROB SCAIFE and ELISABETTA STARNINI

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In memory of St. Glisente

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CONTENTS

1. PREFACE (P.B.)

1.1 Site location and history of the research (P.B.)

The mesolithic site of Laghetti del Crestoso (LC1) (Bovegno, Brescia) is located in the upper Val Trompia, along the northern shore of the lower of the two Laghetti del Crestoso at an altitude of 2006m (fig. 1). The small basins lie at the bottom of a glacial cirque, between

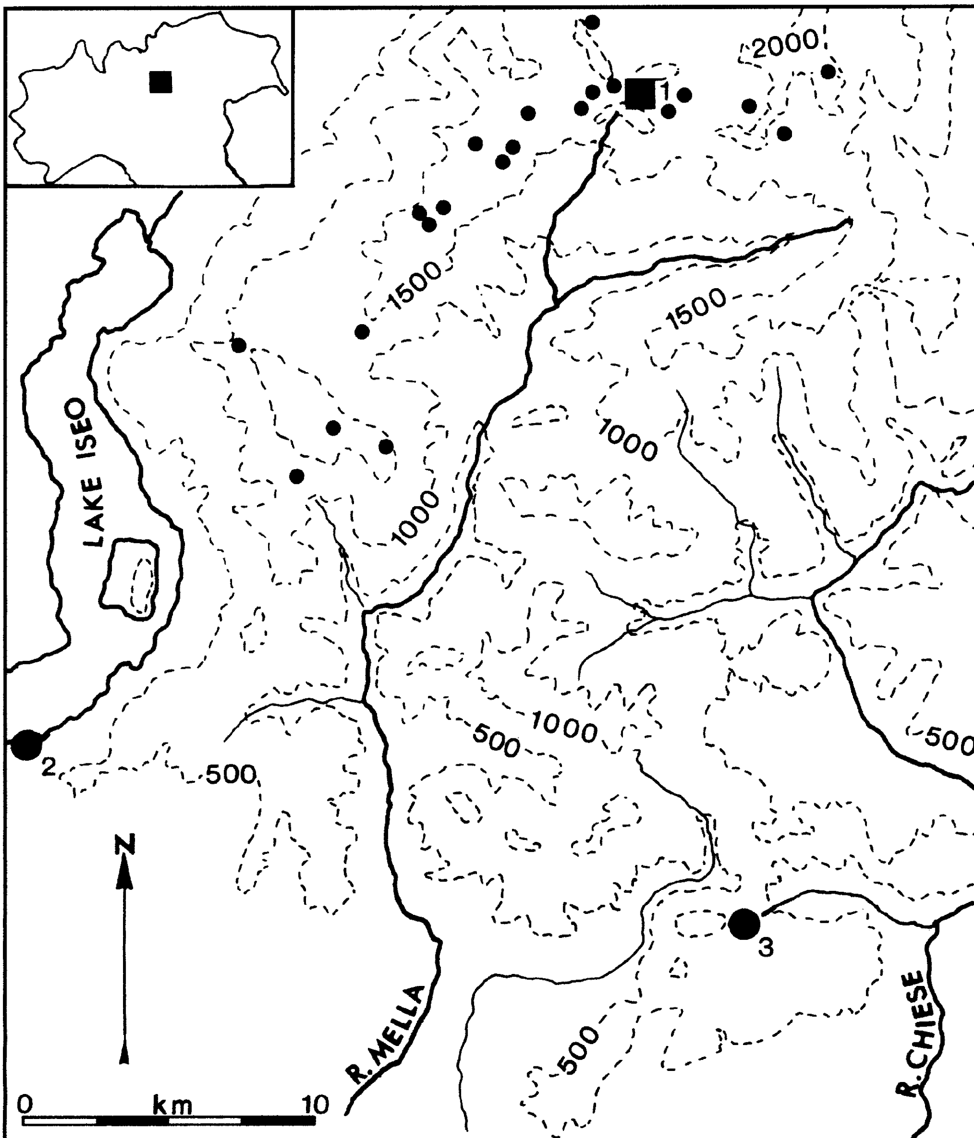


Fig. 1 – Location of the Late Mesolithic Castelnovian site of Laghetti del Crestoso (LC1) in upper Val Trompia (1), of the Mesolithic sites discovered along the watershed (dots) and of the Castelnovian sites of Provaglio d'Iseo (2) and Sopra Fienile Rossino (3) in the Brescia pre-Alps (*drawn by P. Biagi*).

Mt. Colombino (2135m) to the north and Mt. Crestoso (2207m) to the south lying just east of a saddle (2059m) which links upper Val Trompia with middle Val Camonica (fig. 2). The precise geographic location of the site (IGM map Italy 1:25000, Sheet 34ISW, Sacca) is 45°51'24" Lat N, 2°08'17" Long W (fig. 3).

The site was discovered by chance by the writer (P.B.) in September 1984 during a survey along the Val Trompia-Val Camonica watershed. The excavation of a narrow footpath by the Corpo Forestale dello Stato in order to link Malga Stabil Fiorito (*ca.* 1894m) with Lago Rosellino (*ca.* 1875m), uncovered an anthropogenic deposit along the northern shore of the lower lake. After a season of palynological and botanical surveys in the surrounding territory (1986), the first excavation was carried out in September 1987 (Baroni *et al.*, 1990). It was followed by two more seasons in October 1988 and July 1989 (Biagi *et al.*, 1994a; 1994b; Biagi, 1995; 1997a) (1).

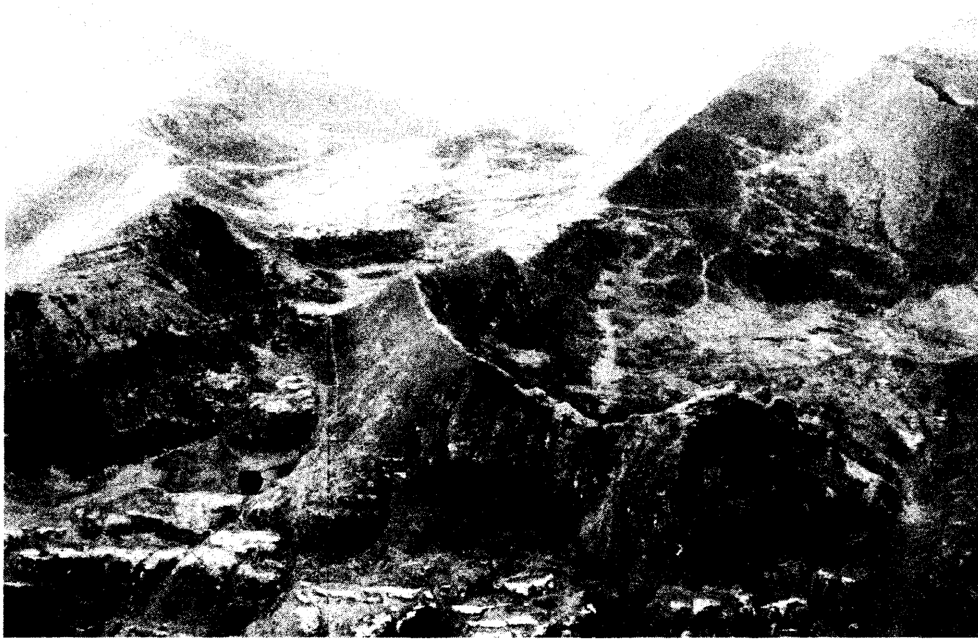
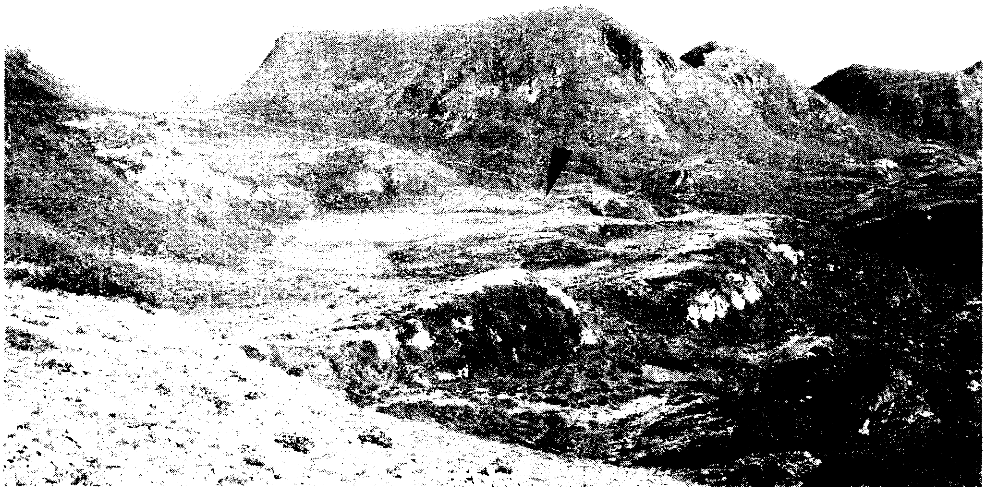


Fig. 2 – Aerial view of the Mesolithic site of Laghetti del Crestoso (dot), east of the saddle separating Val Trompia from Val Camonica, between Mt. Colombino (2135m) to the north and Mt. Crestoso (2207m) to the south (*photo by P. Biagi*).

(1) This research is part of an archaeological project on the «Palaeolithic and Mesolithic peopling along the Val Camonica-Val Trompia-Val Sabbia watershed» financed by the Museo Civico di Scienze Naturali di Brescia.
The Authors are very grateful to Mr. P. Blesio, former Museum Director, who promoted the excavations at the Laghetti del Crestoso. The excavations, directed by one of the writers (C.B.), were carried out with the assistence of S. Baraggi, L. Caniato and S. Rainieri, of the Museo Civico di Scienze Naturali di Brescia, Dott. M. Perini of the Museo Civico di Remedello, and of A. Bianchi and E. Gilli, former students of the Dipartimento di Scienze Storico-Archeologiche ed Orientalistiche of the University of Venice.
Thanks are also due to the Superintendent for the Archaeology of Lombardy, Dott. A.M. Ardovino and to the Director for the Brescian Alpine region, Dott. R. Poggiani-Keller who promoted the research and allowed the Authors to study the finds. Last, but not least, to Dr. B.A. Voytek of Berkeley University (USA) who revised some of the English texts.
All the geographic coordinates mentioned in this volume are those of the italian system (Mt. Mario, Rome).

a



b

Fig. 3 – Location of the Mesolithic site of Laghetti del Crestoso (a) along the northern shore of the lower laghetto (b)(arrows) (*photos by P. Biagi*).

2. STRATIGRAPHY AND PEDOLOGY OF THE SITE (C.B. and C.O.)

2.1 Geological and geomorphological framework (C.B.)

The uppermost part of Val Trompia is characterized by a well known Permian continental sequence with associated volcanic and volcaniclastic rocks resting on the Hercynian metamorphic basement.

In the area of Mt. Crestoso, the bedrock is represented by Late to Middle Permian red beds of the «Verrucano Lombardo» or «Val Gardena Sandstone» (Cassinis *et al.*, 1986), corresponding to the «Monte Mignolo Formation» previously described by Boni *et al.* (1972) and Boni and Cassinis (1973). In this region, the sequence consists of reddish, coarse sandstone and conglomerate of fluvial origin with bed dipping 20-45° towards WNW and NW. A few dozen metres east of the site, the «Dosso dei Galli Conglomerate» (middle to early Permian) outcrops. It underlies the Verrucano which has a similar bedding. The «Collio Formation» lies further to the east and to the south. It consists of early Permian shale to conglomerate of prevalent lacustrine environment with associated volcaniclastic and volcanic rocks.

The landscape is characterized by Late Pleistocene glacial landforms incised into a bedrock, conditioned by the structural pattern. Of particular importance are the glacial cirques filled with lacustrine or peat deposits and the *roches moutonnées* with clear erosional marks produced by glacial scouring. These forms are greatly influenced by the strike and dip of bedding. Their steeper side is more pronounced or craggy where it coincides with the layers head. Fields of erratic boulders can be noticed on the exposed surfaces of the rocks. Very evident, but not so common, are moraines that dam glacial cirques. Above the moraines a podzolic soil is developed, which is some 30-40cm thick. The main depressions are, however, filled with, in some cases, substantial peat deposits.

Periglacial processes were active during the Late Pleistocene and probably also in more recent periods. In fact, rock-glaciers, solifluction lobes and block streams can be seen in the neighbourhood of the archaeological site, in particular along the north facing slopes. Talus slopes and debris cones, covering the lower part of the rocky cliffs, are also documented in the area.

2.2 The excavation (C.B.)

The archaeological excavation was carried out close to the footpath that runs north of the basin where a few flint artefacts had been collected by one of the writers (P.B.) in 1984. A number of hand bore-holes were made in order to define the extent of the site and to detect the area most suitable for excavation. This surface was later subdivided into a grid of 1 metre squares (fig. 4) oriented N 50° E (Nm 1987). A total of 40 square metres were excavated during three campaigns carried out in September 1987, October 1988 and July 1989 respectively, most probably corresponding to some 30-40% of the entire site. The artefacts recovered were recorded *in situ* according to the grid and to their stratigraphic position (the layers are indicated by numbers while «Bot» and «Top» indicate the bottom and the top of the layers themselves). The survey reference level (fig. 5) used was the surface of an isolated boulder lying some 4 metres east of the excavation limit. The original trend of the topographic surface of the excavated area is shown in fig. 5, while figs. 6 and 7 respectively represent the trend of the top (after the removal of the uppermost peat layer) and of the base of the archaeological levels.

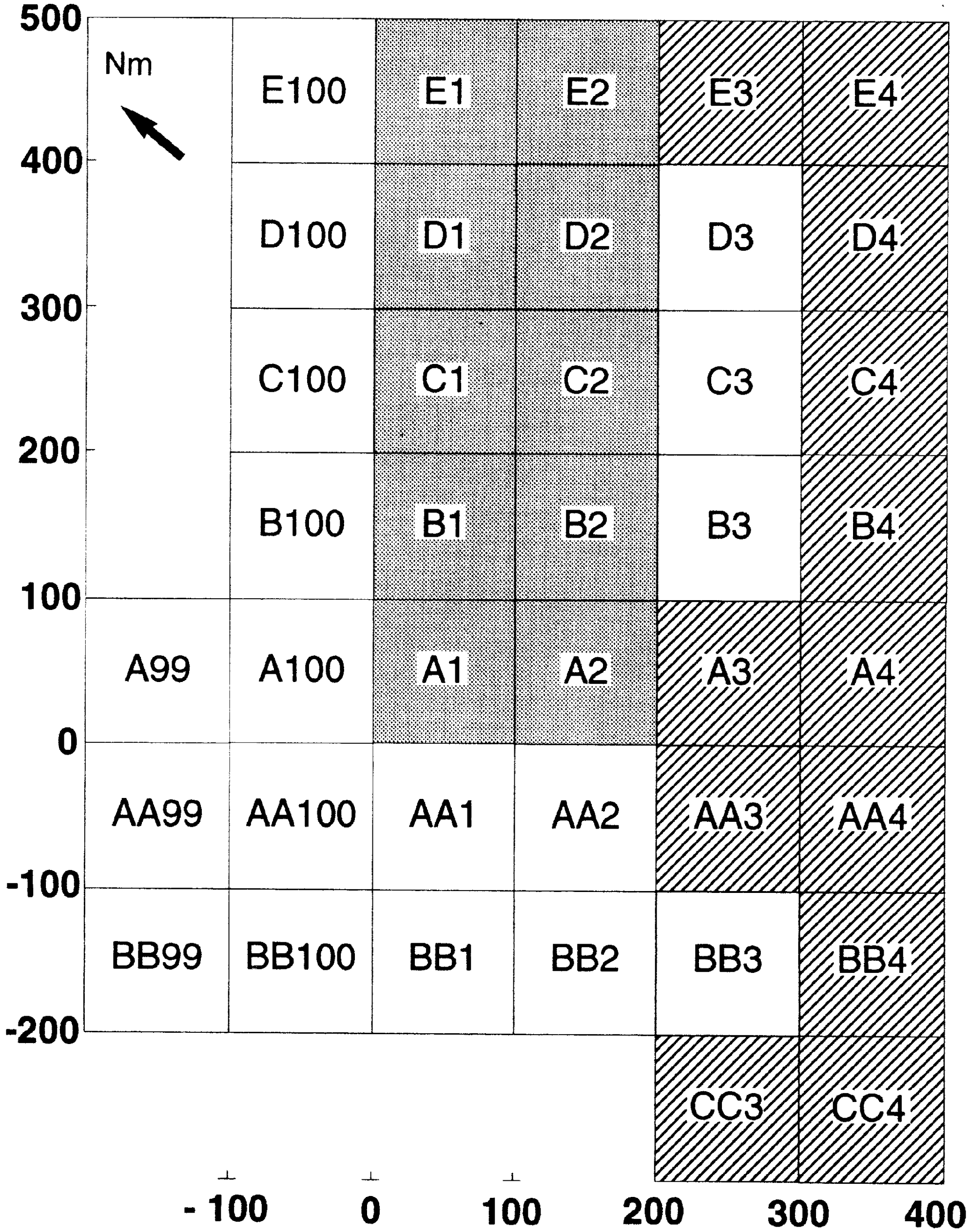


Fig. 4 – Laghetti del Crestoso: reference grid of the excavation area: shaded squares, 1987; white squares, 1988; striped squares, 1989 (*drawn by C. Baroni*).

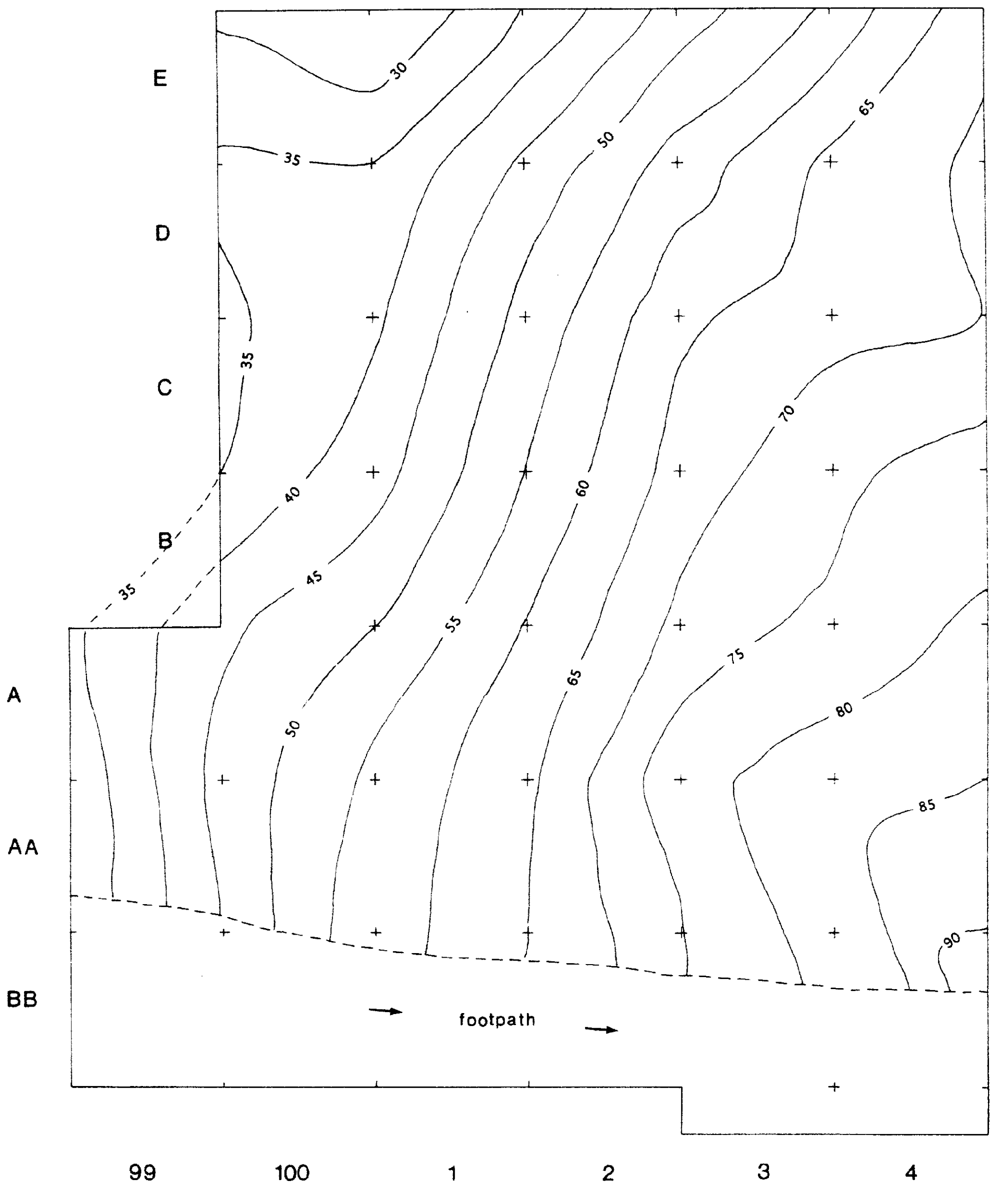


Fig. 5 – Laghetti del Crestoso: surface of the archaeological layer after removing the topsoil (*drawn by C. Baroni*).

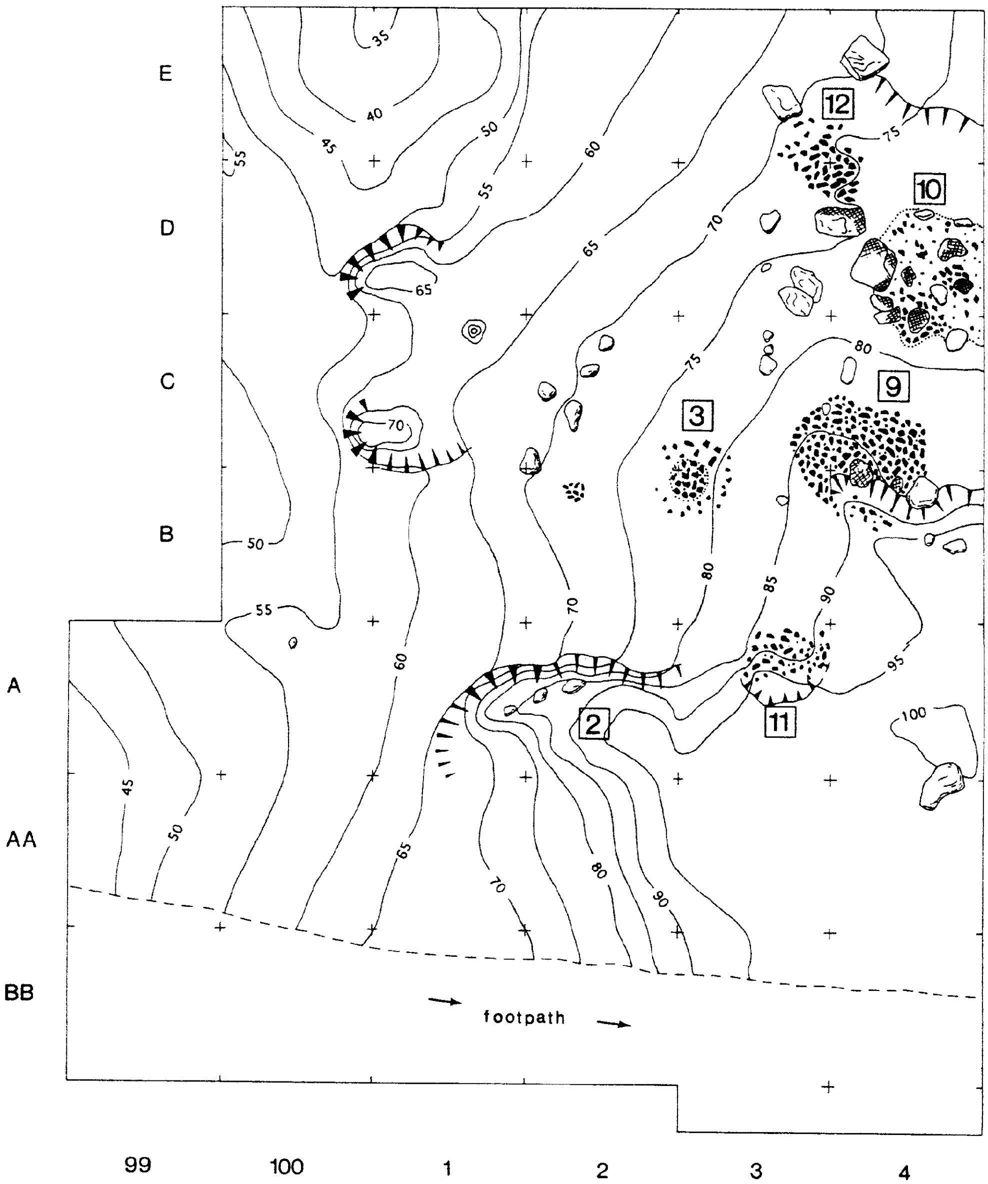


Fig. 6 – Laghetti del Crestoso: plan of the site and distribution of the archaeological features in the upper level (*drawn by C. Baroni*).

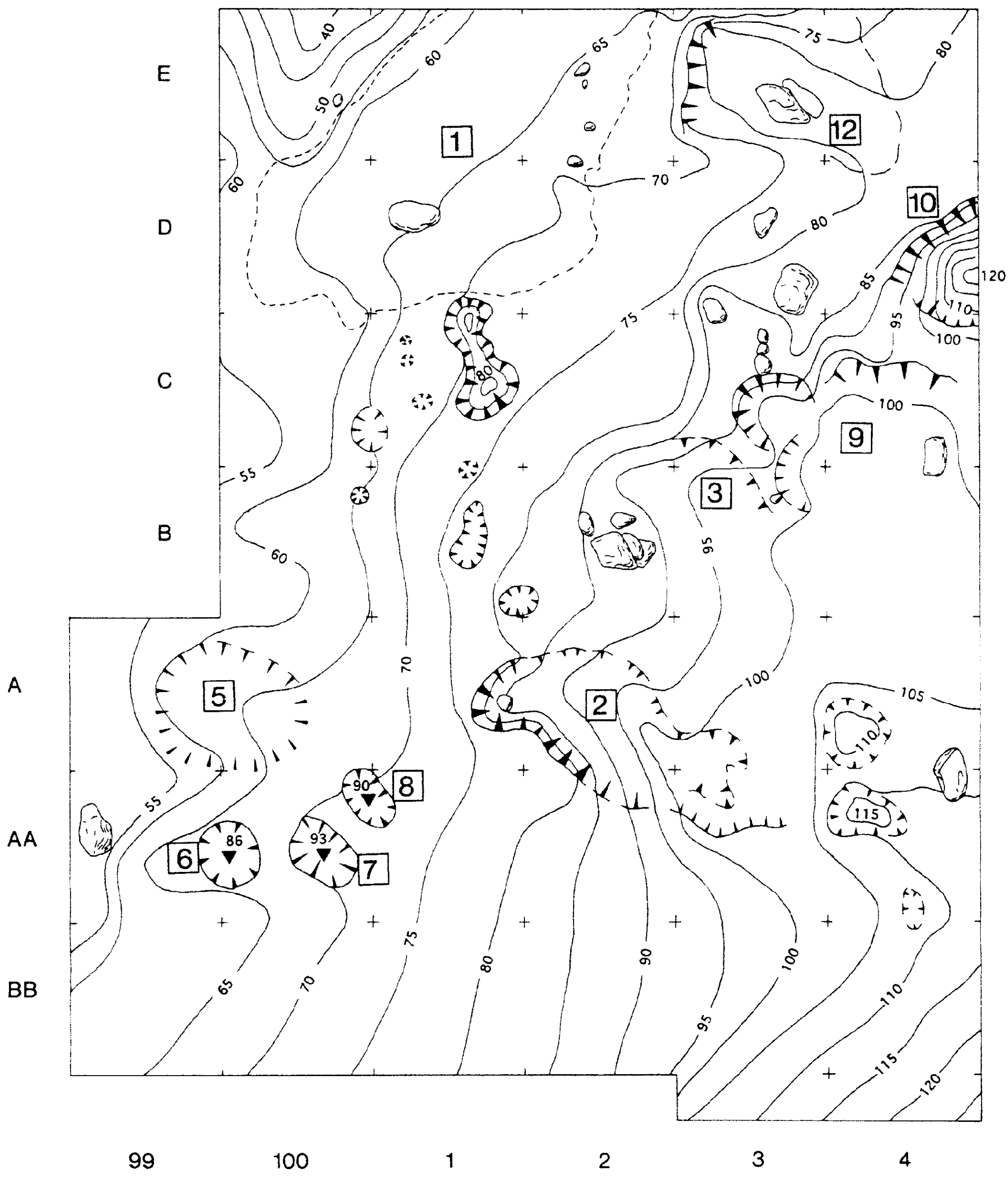


Fig. 7 – Laghetti del Crestoso: plan of the site and distribution of the archaeological features in the bottom excavation level (*drawn by C. Baroni*).

2.3 The stratigraphic sequence and the archaeological structures (C.B.)

The following sequence has been recognized (fig. 8):

1) dark greyish brown (10YR 3-2/2) peat and sandy to silty peat, 5 to >30cm thick. A discontinuous level of laminated peat (1a) at the bottom of this layer has been dated to 1960±60 BP (HAR-8872). Thin lenticular levels of medium to coarse sand are interspersed at different depths. Roots are common. This layer corresponds to the «0» horizons of the soil described in square D100 (see Chapter 2.4.1) (fig. 9). Wavy abrupt boundary to layers 2, 2a, 2b, 5 and 6.

2a-2b) Greyish brown (10YR 4/2) medium to coarse sand, discontinuous, loose, with a few flints and charcoal (no flints in 2b). These two layers were distinguished because they were separated by a depression filled with peat. Level 2a was found in squares B-C/1-100 and the second was excavated in D-E/1-100. Several roots, canals and coproliths of insects and other animals were present. Gentle, wavy clear boundary to 2.

2) Greyish brown (10YR 4/2) medium to coarse sand, rich in charcoal and flint artefacts, which is the main archaeological horizon; it correlates with layer 5; loose to slightly hard; linear to gentle, wavy sharp boundary to 2c, 3, 4, 7, 8, 9, 10 and 11.

2c) Thin layer (0.5/2 cm) of charcoal in a reddish, sandy matrix corresponding to Structure 1 (fireplace: fig. 7). Gentle, wavy sharp boundary to 4.

3) Dark brown (7.5-10YR 4/2) coarse sand, loose, without flint tools; very wavy, sharp boundary to 4, 9 and 10; corresponding to the «E» pedologic horizon in square D100 (see Chapter 2.4.1).

4) Reddish brown (5YR 4/4-3), lithochromic, coarse sand to gravelly, sterile sand, at the bottom of the anthropogenic layers; corresponding to the horizons «Bs» and «BC». A horizon of Fe-Mn concretions, some millimetres thick, develops in the upper part of layer 4. It corresponds to the «Bplacic» horizon of the soil described in D100 (see Chapter 2.4.1). The lower limit is gradual on the weathered rock.

5) Dark greyish brown (10YR 3/2) sand and sandy loam with charcoals and flints. This layer correlates with 2 even though it contains a higher percentage of organic matter; it was found only in squares D-E/100. This layer corresponds to the «Ah» horizon of the soil described in D100. Clear boundary to 3.

6) Brown (7.5YR 4/2) coarse, gravelly sand with many rounded, white quartzite pebbles; loose to friable, locally coarse granular structure, weakly developed. Archaeologically sterile. It is present only in squares A-AA/99-100. Gentle, wavy, sharp and clear boundary to 7 and 8.

7) and 8) Greyish brown (10YR 4-5/2) fine to medium silty sand; slightly hard; coarse granular structure weakly developed. Layer 7 covers Hearth 5, while layer 8 was distinguishable because it filled Structures 6, 7 and 8. Wavy, sharp boundary to 9.

9) Dark brown (10YR 3-4/3) coarse, gravelly sand, loose; sterile; wavy, sharp boundary to 4.

10) and 11) Dark brown (7.5YR 34/2) medium to coarse silty sand with a few small pebbles; friable, coarse granular structure, weakly developed. Layer 10 is covered by layer 3 (in A-AA/1-2), while layer 11 lies underneath layer 2 (in A3, A4, AA3, AA4 e B4). This layer has been interpreted as the residual part of an eroded «A» horizon of a buried soil (Ab), dated to 3450±100 BP (Beta-35220). Wavy, sharp to clear boundary to 9.

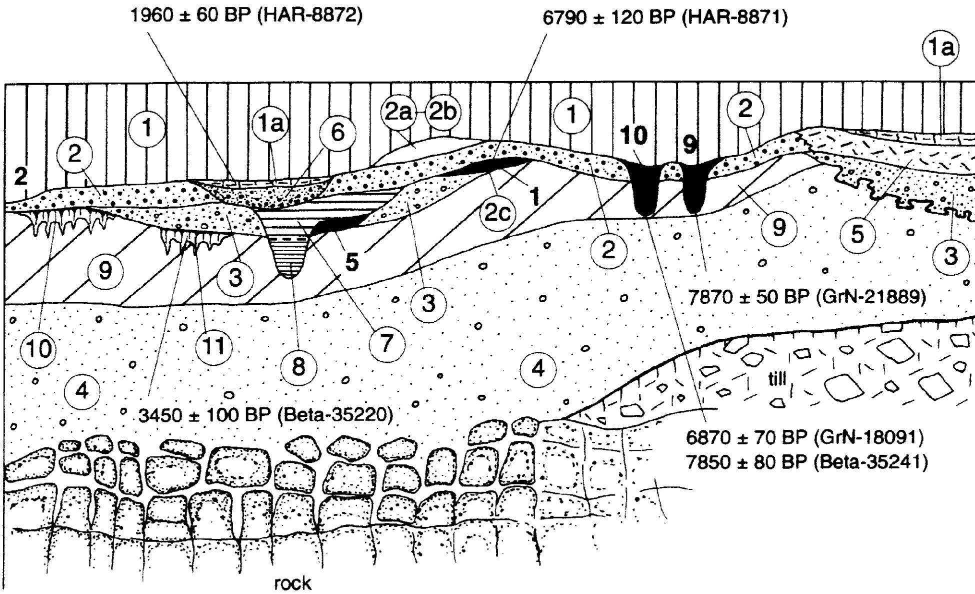


Fig. 8 – Laghetti del Crestoso: schematic NE-SW section of the deposits with the ^{14}C dates, the numbers of the structures (black) and of the layers (circled) (*drawn by C. Baroni*).

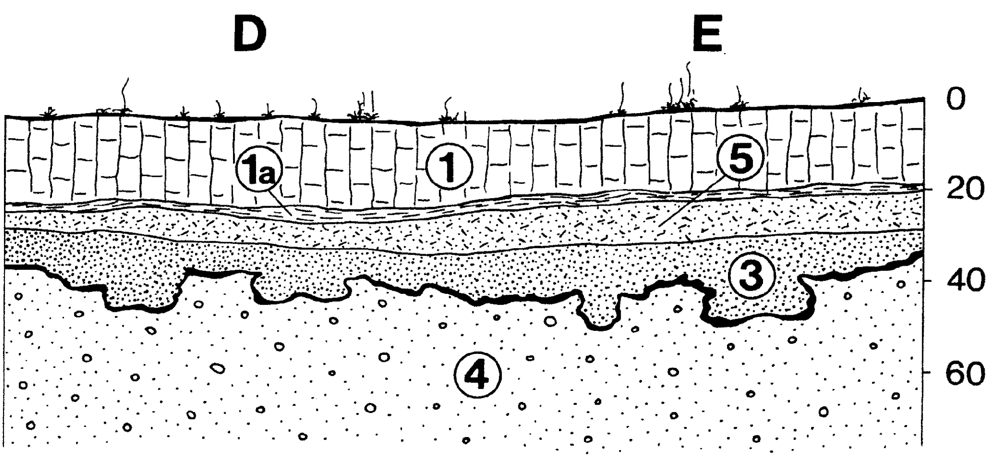


Fig. 9 – Laghetti del Crestoso: section through the deposits in squares D-E/100 (*drawn by C. Baroni*).

The sedimentological analyses and the more representative granulometric curves obtained from the layers recognized during the excavation are represented in fig. 10.

The site yielded several structures such as fireplaces, pits and post-holes (figs. 6 and 7), namely:

1) Large fireplace (D-E/1-2-100) composed of a thin level of charcoal in a matrix of reddish sand (called layer 2c), at the bottom of layer 2 (trend parallel to the surface). A charcoal sample from this fireplaces was dated to 6790±120 BP (HAR-8871).
2) Depression (pit) in squares A1-2 with flint artefacts horizontally distributed on the bottom surface. The structure had been filled with peat with lenses of sand (layer 1).
3) Small fireplace modelled into layer 2 and filled with charcoal (squares B-C/3).
4) Part of Structure 9 distrubuted in square C3. This has been named Structure 9 in the excavation plan.
5) Large fireplace parallel to the surface, in squares A99-100. It lies above layer 9 and was covered by layer 7. It is related to Structures 6, 7 e 8 (fig. 11).

6), 7) and 8) Post-holes (?) in AA99-100-1, excavated into layer 9 and filled by layer 8 (=7). These are related to Hearth 5 (fig. 11).

9) Fireplace (B-C/3-4). This is a depression 80 cm wide and 20 cm deep related to layer 2, but excavated into layer 9. It was filled with two main levels containing different concentrations of charcoal separated by some heat-fractured pebbles. The pit was covered with the uppermost peat layer. A charcoal sample of *Picea excelsa* gave a date of 7870±50 BP (GrN-21889).
10) Pit in squares C-D/4, some 1 m wide and 25 cm deep, containing heat-fractured pebbles, excavated in layer 9, but related to layer 2 which has partly filled the pit (figs. 12 and 13). The charcoal from this structure was dated to 6870±70 BP (GrN-18091) and 7850±80 BP (Beta-35241).
11) Small hearth filled with charcoal (square A3).
12) Small hearth in D-E/3-4, filled with charcoal and delimited by a few heat-fractured pebbles.

2.4 The soils (C.O.)

Previtali *et al.* (1992) have described the existence of podzolic soils developed on acid parent materials in the upper Val Camonica between 1550 and 2200m. The soil observed in the excavated area is a podzol similar to those described by the above-mentioned authors.

In order to give a detailed description of the soil, some micromorphological analyses have been made on three samples from a profile taken from square D100 of the excavated area.

2.4.1 Description of the profile

Parent material: morainic and colluvial detritus on Permian conglomerates and sandstones
Pedoclimate: Udic/Aquic-Cryic
Drainage: locally difficult
Classification: Haplic podzol (F.A.O.-U.N.E.S.C.O., 1985; 1990);
Cryoaquod (Soil Survey Staff, 1975);
Placic podzol (A.F.E.S., 1992)

0-5cm: O1 – sandy silty loam; 10YR 3/2 (dark greyish brown); many roots; humic; soft; clear boundary.

5-20cm: O2 – silty loam; 10YR 2/2 (very dark brown); many small and medium-sized woody roots; humic; soft; sharp boundary.

20-27cm: Ah – sandy loam; 10YR 3/2 (dark greyish brown); many small and medium-sized roots; small charcoals common; Castelnovian artefacts; humic; few strong; clear boundary.

27-34cm: E – sandy; 7.5YR 4/2 (dark brown); small mottles common, 7.5YR 7/6 (reddish yellow); few stones; less humic; moderately strong; clear wavy boundary.

34-35cm: Bplacic – strong crust of iron oxides.

35-53/56cm: Bs – sandy gravelly; 5YR 4/4 (reddish brown); common sandstones; less humic; strong; clear wavy boundary.

53/56-70cm: BC – gravelly sandy; 5YR 4/4 (reddish brown); many sandstone stones; few humid; strong; boundary not exposed.

The data of the micromorphological analyses are reported in Appendix 1.

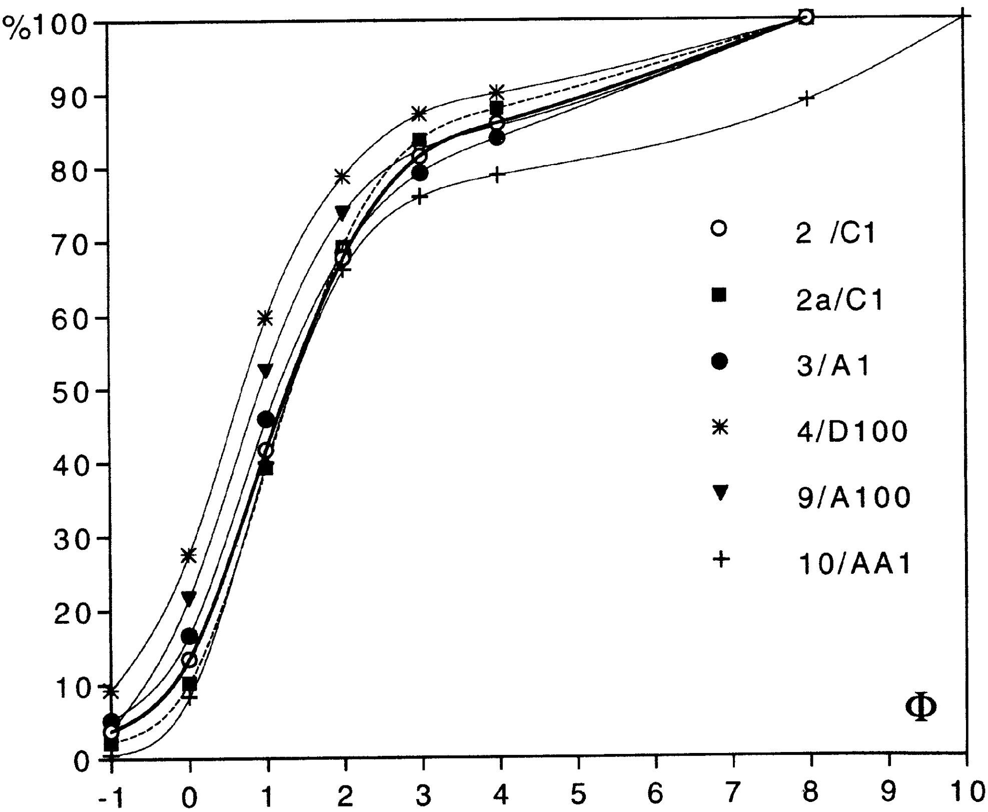


Fig. 10 – Laghetti del Crestoso: granulometric curves of the soil samples with the layer and square of provenance shown (*drawn by C. Baroni*).

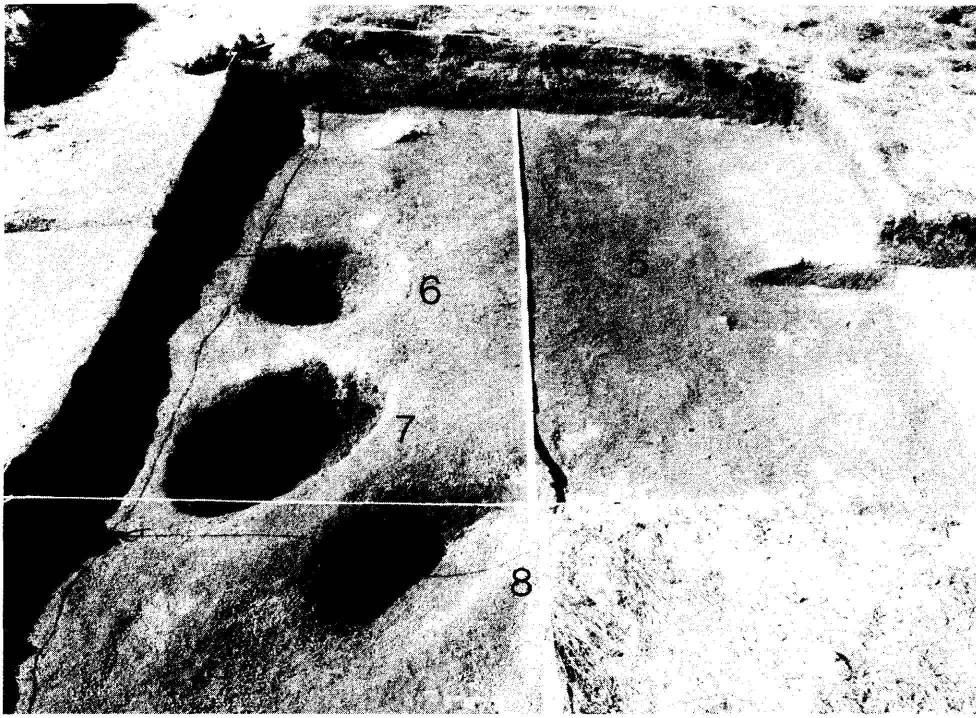


Fig. 11 – Laghetti del Crestoso: Post-holes (?) 6-8 (left) and Hearth 5 (right) (*photo by P. Biagi*).

2.5 Discussion of the stratigraphic sequence (C.B.)

Above the bedrock and the Pleistocene glacial deposits (these latter are not present in the excavated area), lies a series of colluvial deposits (layers 4, 9, 10 and 11), with traces of periglacial deformation. Layers 10 and 11 are interpreted as residual strips of the «A» buried horizon of a soil preceding the Castelnovian Mesolithic occupation. An erosional phase, followed by the deposition of layer 3, separates layer 10 from the richest archaeological layer 2 and from other layers which cover Hearth 5 and fill Post-holes 6, 7 and 8 (layers 7 and 8). This layer has been dated to 3450±100 BP (Beta-35220). The date is far more recent than expected given the stratigraphic position of the sample. It can be explained as caused by the rejuvenation process due to an enrichment of younger organic matter in the soil (WANG and AMUDSON, 1996).

Almost all the artefacts come from layer 2 which is correlated with layer 5. This latter has the more developed characteristics of an Ah horizon of a podzolic soil already present (and probably still forming) during the Mesolithic period.

Several archaeological structures are related to layer 2, into which most of them are excavated. Others, in particular Hearth 1, lie at its bottom. From a stratigraphical point of view, three phases of utilisation of the hearths can be distinguished: the first is represented by Hearth 5, which is followed by Hearth 1 and subsequently by Pits 9, 10 and Hearths 11 and 12. On the contrary, the ^{14}C dates are only related to two phases of occupation.

After the abandonment of the site, another slope erosional phase led to the deposition of the sands which constitute layers 2a, 2b and 6. These were later eroded and buried by layers of

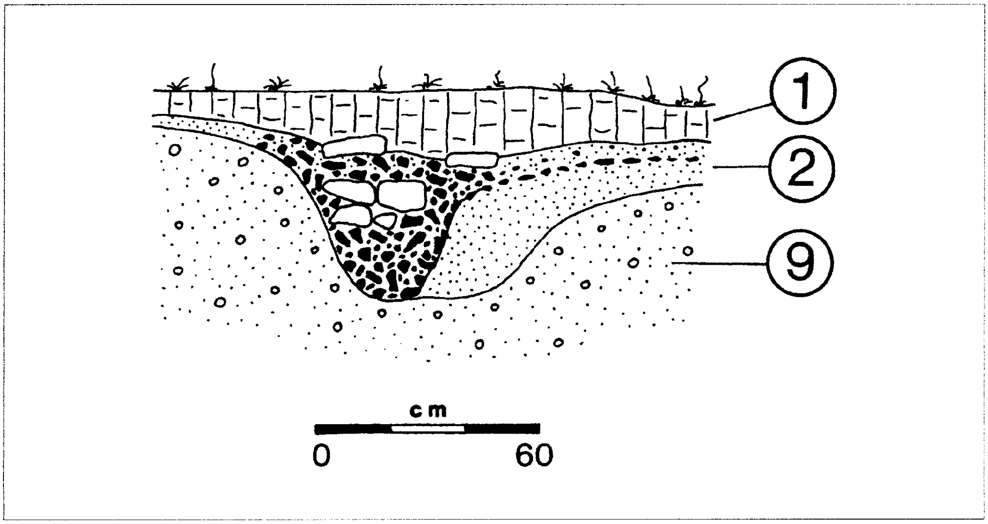


Fig. 12 – Laghetti del Crestoso: section through the deposits of Pit 10 (*drawn by C. Baroni*).

Fig. 13 – Laghetti del Crestoso: Pit 10 during excavation (*photo by P. Biagi*).

peat (layers 1 and 1a) whose first deposition took place around 1960±60 BP (HAR-8872) during varied environmental conditions. The peats filled the depressions and sealed the sequence, thus favouring the preservation of the archaeological site.

3. THE FLINT ASSEMBLAGE (P.B., C.L. and E.S.)

3.1 Raw material procurement and use strategies (E.S.)

The flint artefacts have been grouped according to their macroscopic characteristics such as colour (MUNSELL, 1992), texture, surface aspect, cortex and transparency, into 17 raw material groups, namely:

F1 (65 pieces): from grey (2.5Y 5/1) to greyish brown (2.5Y 5/2)/light olive brown (2.5Y 5/3) with very dark grey (N3) spots and stripes; non-transparent or slightly translucent by the edges; waxy, lustre surfaces; white cortex; nodules.
Categories of artefacts: decortication and core preparation flakes, laminar debitage (56), truncations (1), long scrapers (1) and microburins (7).
Source: Mt. Alto.

F2 (19 pieces): from light grey (2.5Y 7/1) to pale yellow (2.5Y 7/3) with yellowish brown (10YR 5/8) stripes; non-transparent or slightly transparent by the edges; waxy, lustre surfaces; white cortex; nodules.
Categories of artefacts: crested blades (1), blades and flakes (17) and fabricators (1).
Source: Mt. Alto.

F3 (38 pieces): light brownish grey (2.5Y 6/2) with narrow, light yellowish brown (2.5Y 6/4) stripes; non-transparent of slight transparent by the edges; waxy, lustre surface; light grey (2.5Y 7/2) cortex; nodules.
Categories of artefacts: cores (1), laminar debitage (29), backed blades (1), triangles (2), trapezes (3), long scrapers (1) and microburins (1).
Source: Mt. Alto.

F4 (191 pieces): light grey (10YR 7/1-7/2) with large white spots; from non-transparent to slightly transparent by the edges, with more translucent veins; from dull to waxy, lustre surfaces; white cortex; nodules.
Categories of artefacts: cores (1), end-scrapers (1), truncations (2), trapezes (2), long scrapers (2), notched blades (2) decortication and core-preparation flakes, bladelets and debitage (181).
Source: Mt. Alto.

F5 (22 pieces): from grey (2.5Y 5/1)/greyish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4); non-transparent or slightly transparent by the edges; waxy, lustre surfaces; white, chalky cortex; nodules.
Categories of artefacts: laminar debitage (14), truncations (1), long scrapers (1) and microburins (6).
Source: Mt. Alto.

F6 (4 pieces): olive grey/light olive grey (5Y 5.5/2); non-transparent; waxy, lustre surfaces.
Categories of artefacts: flakes and blades (2), truncations (1) and trapezes (1).
Source: Mt. Alto.

F7 (73 pieces): from light brownish grey (2.5Y 6/2) to light grey (2.5Y 7/2) with grey (2.5Y 5/1) stripes; non-transparent; waxy, lustre surfaces.
Categories of artefacts: blades, flakelets (26), truncations (1), trapezes (8) and microburins (17).
Source: Mt. Alto.

F8 (1 piece): light brownish grey (2.5Y 6/2); non-transparent; waxy, lustre surfaces.
Categories of artefacts: bladelet (1).
Source: Mt. Alto.

F9 (14 pieces): light olive grey (5Y 6/2); completely non-transparent; dull surfaces; light brownish grey (10YR 6/2) cortex; nodules (?).
Categories of artefacts: decortication flakes (14).
Source: Mt. Alto (?).

F10 (2 pieces): grey (5Y 6/1); non-transparent; waxy, lustre surfaces. white cortex; nodules.
Categories of artefacts: cores (1) and bladelets (1).
Source: Mt. Alto.

F11 (3 pieces): from brown (10YR 5/3) to yellowish brown (10YR 5/6); a few small, light grey (10YR 7/2) spots; non-transparent; waxy, lustre surfaces; white cortex; nodules.
Categories of artefacts: core (1), long scrapers (1) and flakelets (1).
Probable source: Mt. Alto.

F12 (8 pieces): dark grey (N4). Light olive grey (5Y 6/2) under cortex. Completely non-transparent; dull surfaces; light brownish (2.5Y 6/2) cortex; nodules.
Categories of artefacts: pre-core (1) and decortication flakelets (7).
The light olive grey narrow band under the cortex is almost identical to F9. Also the aspect of the cortex is very similar. Therefore we cannot exclude that F9 and F12 come from the same source, despite the darker dominant colour of the latter, but considering that F9 is represented only by decortication flakes.
Probable source: Franciacorta Hills.

F13 (27 pieces): from dark greyish brown (2.5Y 4/2) to olive brown (2.5Y 4/3), with very few white spots; translucent by the edges; waxy surfaces; white cortex.
Categories of artefacts: laminar debitage (flakelets and corticated bladelets) (27).
Probable source: Lessini Hills.

F14 (18 pieces): from yellowish brown (10YR 5/6)/brownish yellow (10YR 6/6) to light brownish grey (2.5Y 6/2); non-transparent or slightly translucent by the edges; waxy, lustre surfaces; white cortex.
Categories of artefacts: crested blade (1), bladelets and flakelets (17).
Probable source: Lessini Hills (?).

F15 (2 pieces): red (2.5YR 5/6); non-transparent; waxy, lustre surfaces.
Categories of artefacts: long scrapers (1) and trapezes (1).
Probable source: Lessini Hills (?).

F16 (2 pieces): yellowish brown (10YR 5/4); non-trasparent; waxy, lustre surfaces.
Categories of artefacts: trapezes (2).
Source: unknown.

F17 (1 piece): dark reddish grey-reddish brown (5YR 4/2.5); non trasparent; waxy, lustre surfaces; light grey (10YR 7/2) cortex; nodules.

Categories of artefacts: bladelets (1).

Source: unknown.

The most represented raw material is flint from the Mt. Alto outcrops (PELLEGATTI, 1992-93) south-west of Lake Iseo, from which 88.2% of the artefacts have been obtained (fig. 14).

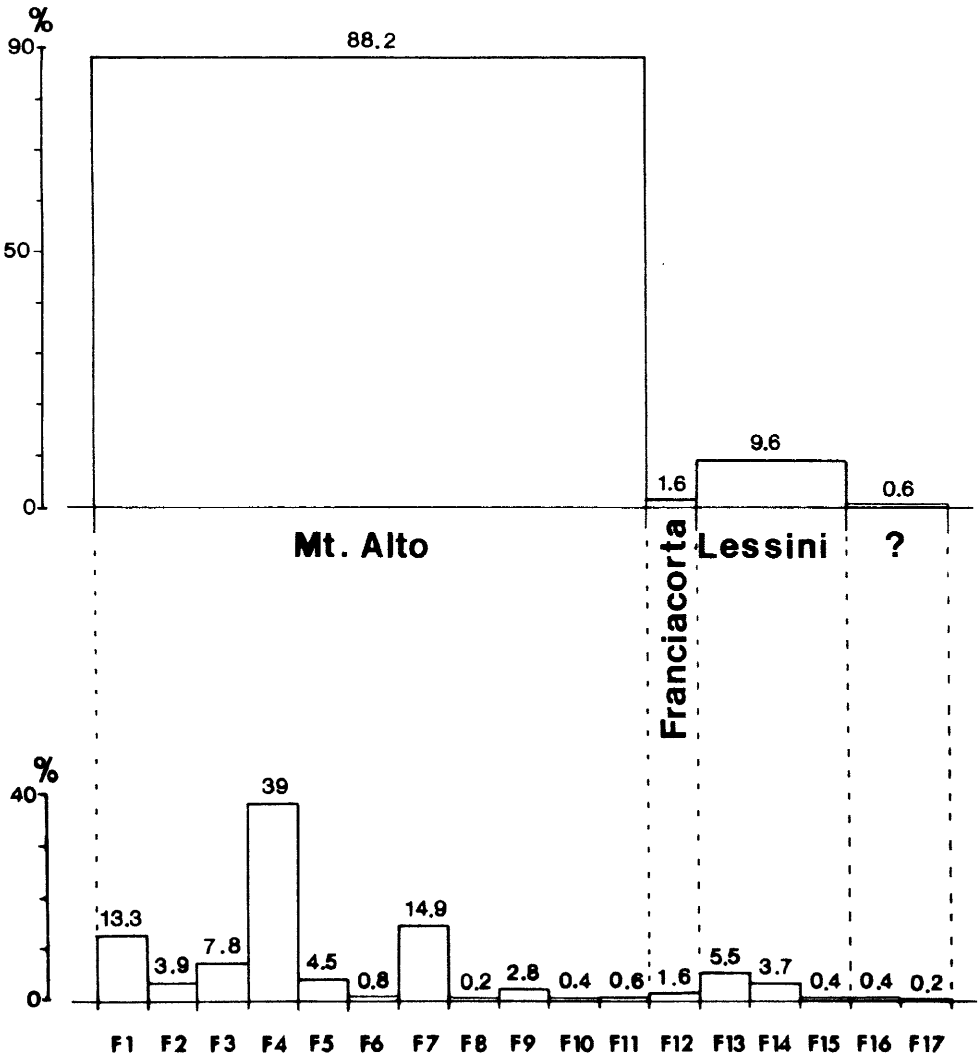


Fig. 14 – Laghetti del Crestoso: relative and cumulative histograms of the flint groups and their provenance (*drawn by E. Starnini*).

A smaller percentage (1.6%) comes from the region of the Franciacorta Hills, a few kilometres south-east of the same lake (fig. 48). It was not possible to define the raw material source of 0.6% of the artefacts. The remaining 9.6% most probably comes from the Lessini Hills in the Veronese or from the eastern moraines of Lake Garda (BARFIELD, 1994) (2).

The raw material was collected as nodules or pebbles, probably from secondary deposits, and carried away in such a form up to the high altitude camps. This is testified by the presence of decortication waste at the site. Then the core, if not completely exploited, was probably taken away, as the presence of one single laminar debitage waste from one core of Lessinian flint would indicate (fig. 25D). In other cases, as for group F16, the exclusive presence of finished tools (armatures) would suggest that these instruments had been brought into the site already made.

3.2 Typological analysis (P.B.)

The industry has been firstly analysed as representing a unic complex, that is considering all the artefacts as they were recovered during excavation. It has been described following the method of G. LAPLACE (1964), apart from the cores and the pre-cores, described according to the typological list of BROGLIO and KOZLOWSKY (1983) (see Appendix 2).

The main characteristics of the lithic assemblage is shown in table 2, below and in fig. 15:

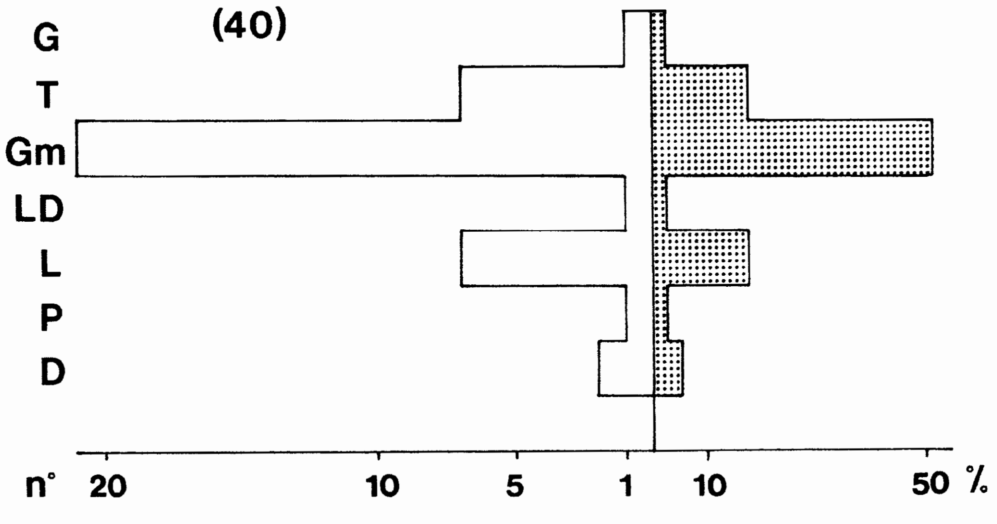


Fig. 15 – Laghetti del Crestoso: numerical (left) and percentage (right) histograms of the instruments (40). G=end scrapers, T=truncations, Gm=geometrics, LD=backed blades, L=long scrapers, P=points, D=denticulates (*drawn by P. Biagi*).

(2) Thanks are due to Dr. L.H. Barfield of Birmingham University (UK) for useful discussion and advice on the raw material provenance.

Table 2

Tool type	Provenance		
	surface	excavation	(%)
Pre-cores	–	1	
Cores	1	3	
Core trimming blades	–	4	
End-scrapers	1	–	(2.5)
Truncations	3 (1*)	4	(17.5)
Triangles	–	2	(5.0)
Trapezes	2	17	(47.5)
Backed blades	–	1**	(2.5)
Long scrapers	–	7	(17.5)
Points	–	1	(2.5)
Denticulates	–	2	(5.0)
Microburins	2	35	
Instruments (total)	6	34	
Unretouched artefacts	42	496	
(complete)	nc	(193)	
(burnt)	nc	(97)	
(corticated)	nc ***	(135)	
Microburins/Trapezes: 1.9			
Geometrics/Instruments: 52.5			

*fragment of trapezoidal geometric
**fragment of triangle (?)
***not counted

The instruments have been preferably obtained from microbladelets (34=85.0%), hypermicrobladelets (4=10.0%), flakes (1=2.5%) and microflakes (1=2.5%). The blade index is extremely high (95.0%).

As regards the complete, unretouched artefacts (193), they have been measured and plotted according to Bagolini's (1968) method. The length/width diagram shows the presence of 54 (28.0%) blades, 34 (17.6%) blade-like flakes and 105 (54.4%) flakes. The microliths are the best represented group (88=45.6%), followed by the hypermicroliths which are 53 (27.5%) and the normoliths (43=22.3%); while the macroliths are much lesser common (9=4.6%) (fig. 16).

The carination indexes show the predominance of very flat (77=39.9%) and flat (59=30.6%) artefacts.

Pre-cores (PN)

One only specimen is represented by a carenoid pre-core from a list of black flint with refitting flakes and flakelets (fig. 24/A).

Cores (N)

Four subconical, exhausted, bladelet-type cores, with one prepared horizontal platform obtained from small pebbles. They show bladelet scars on one face (figs. 17/1 and 20/A-C).

End scrapers (G)

Only one fragment of a (short ?) end scraper on proximal bladelet end, with slightly nosed front, collected from the surface (fig. 17/2).

Truncations (T)

The collection includes six normal (figs. 17/3-7 and 22/C) and one oblique truncations (fig. 17/8). One of the normal specimens which has a *piquant trièdre* point, is most probably a fragment of trapezoidal arrowhead (fig. 17/7).

Geometric tools (Gm)

Are represented by two hypermicrolithic, scalene triangles (fig. 17/9 and 10) and nineteen trapezes (fig. 17/11-29). Among these latter, two morphological types can be clearly distinguished: those of rectangular or scalene, more rarely isosceles, type ones with a concave base opposed to an unretouched *piquant trièdre* point (fig. 17/11-24); and those with two oblique,

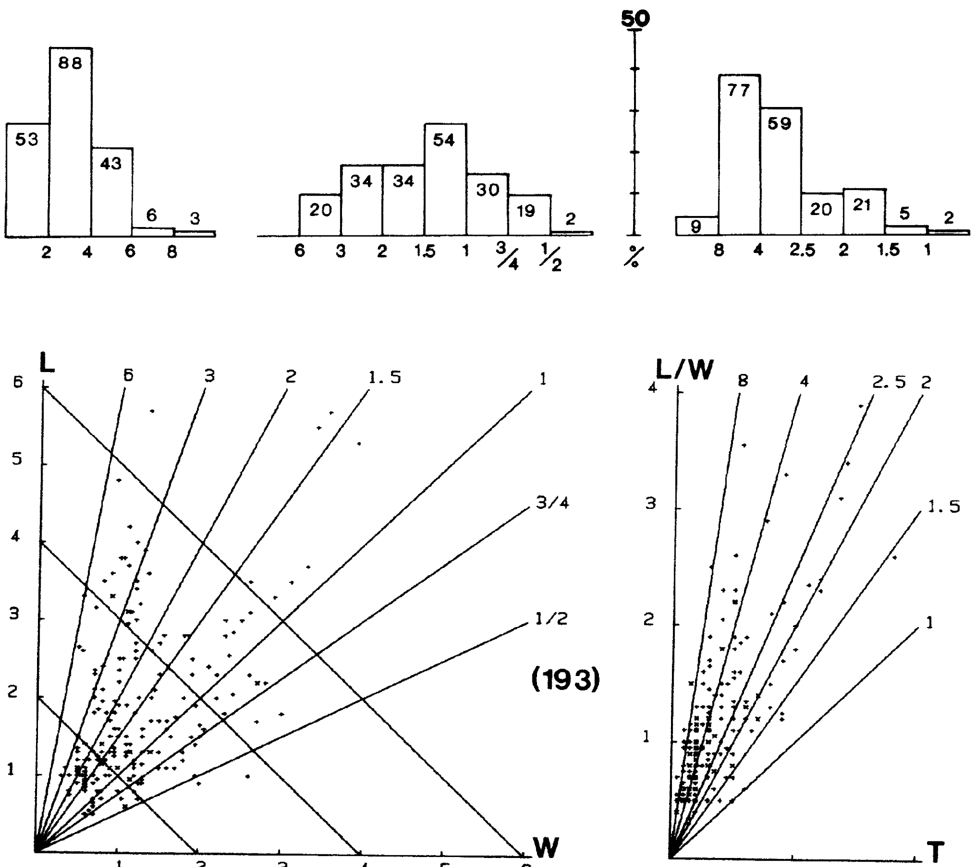


Fig. 16 – Laghetti del Crestoso: length-width and length/width-thickness diagrams and histograms of the complete unretouched artefacts (193) (*drawn by P. Biagi*).

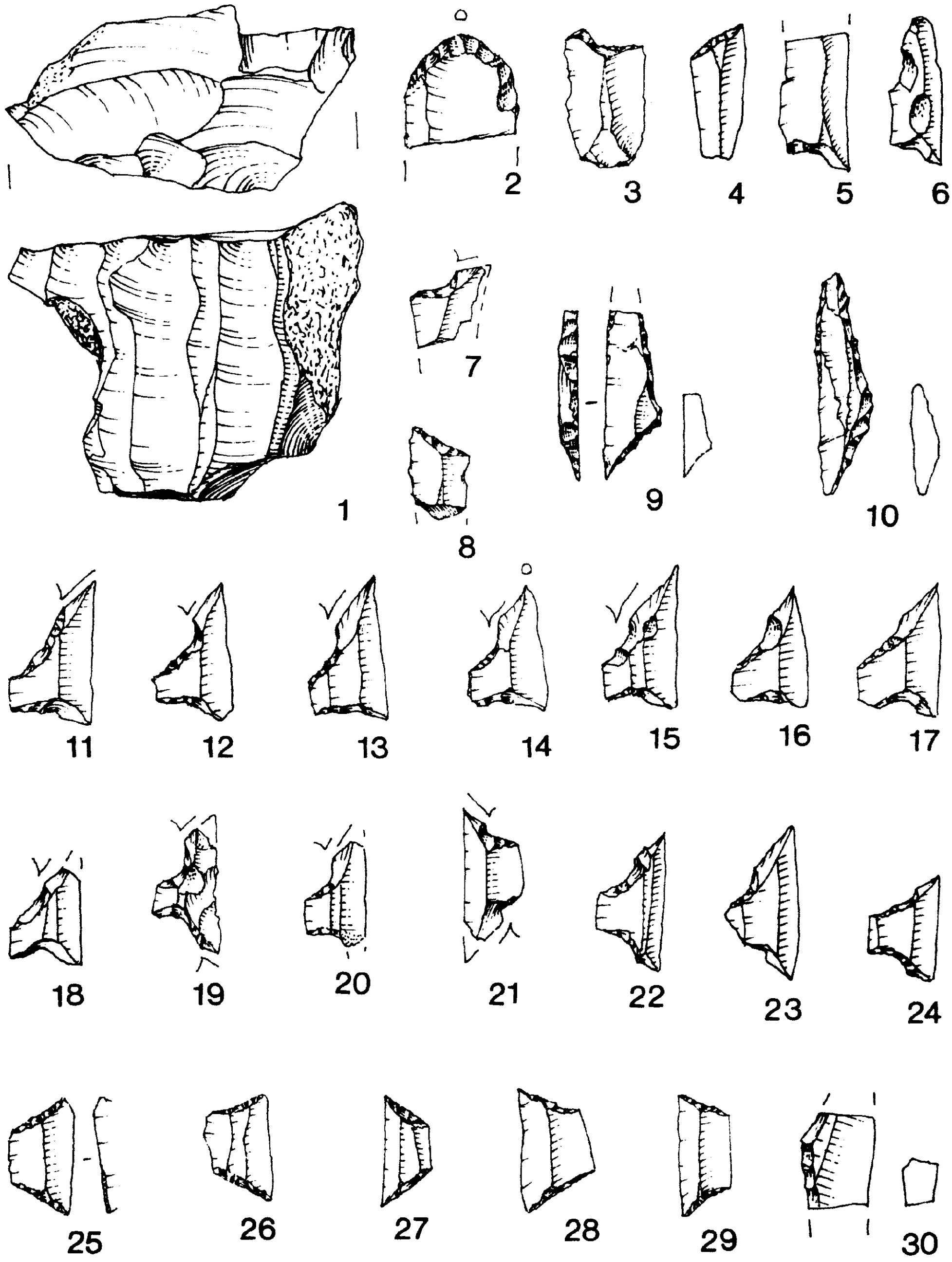


Fig. 17 – Laghetti del Crestoso: flint tools: core (1), end scraper (2), truncations (3-8), triangles (9 and 10), trapezes (11-29), backed bladelet (30) (1:1) (*drawn by G. Almerigogna*).

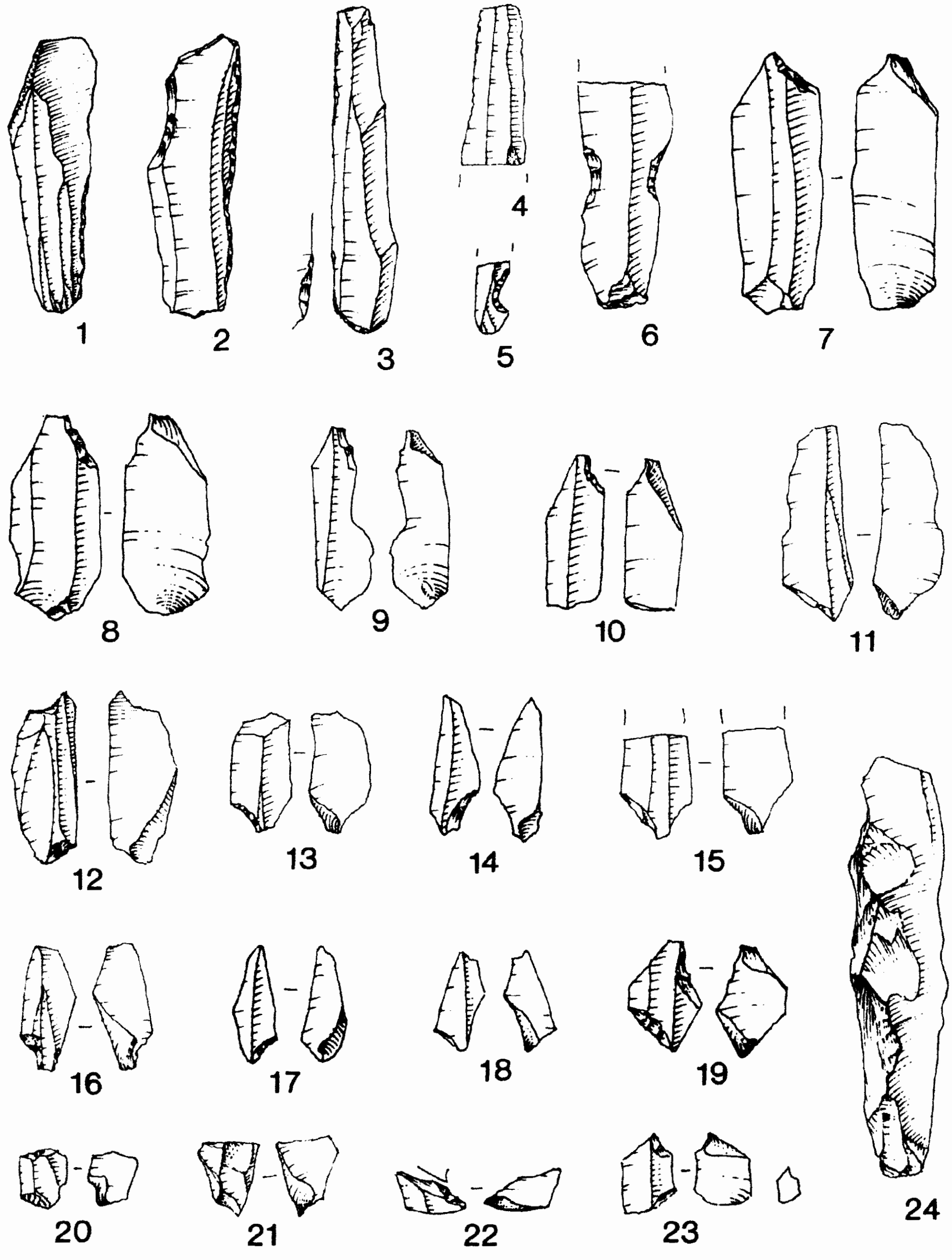


Fig. 18 – Laghetti del Crestoso: flint tools: long scrapers (1-4), denticulates (5 and 6), microburins (7-23), core trimming blade (24) (1:1) (*drawn by G. Almerigogna*).

totally retouched truncations, of almost isosceles shape (fig. 17/25-29). The length/width ratio of the complete trapezes is shown in fig. 19a.

Backed blades (LD)

Only one small fragment of microbladelet with steep, abrupt retouch along the left edge which might be part of a fragmented, scalene triangle (fig. 17/30).

Long scrapers (L)

Seven long scrapers (or retouched bladelets) have a simple, marginal, proximal (fig. 18/1) or continuous retouch, along one of the edges (fig. 18/2-4).

Points (P)

The only instrument which can be classified in this group is a thick, carenoid point, retouched all over the surfaces, with evident traces of wear at both ends (fig. 25/G).

Denticulates (D)

The assemblage includes one simple notch, probably representing the initial stage in the manufacturing of a hypermicrolithic geometric (fig. 18/5), and one typical blade with mesial, bilateral, opposed notches obtained with a simple, deep retouch (fig. 18/6).

Microburins (Mb)

Ten proximal (fig. 18/7-10 and 23), twenty-six distal (fig. 18/11-18, 20-22) and one double specimen (fig. 18/19). The width/number diagram of these residuals is represented in fig. 19b. It clearly shows that most of the microburins are discards of the preparation of the trapezoidal geometrics.

Core trimming blades (Ct)

The collection includes four core trimming blades (fig. 18/24).

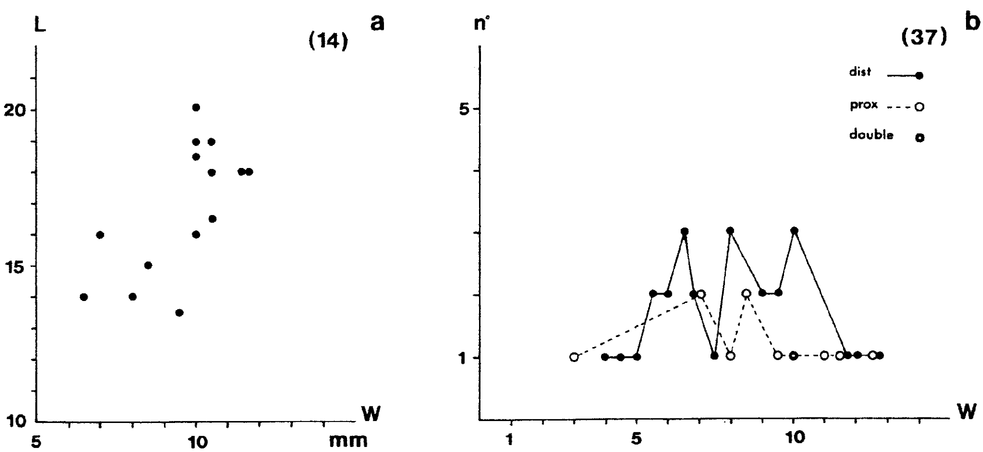


Fig. 19 – Laghetti del Crestoso: length-width diagram of the trapezes (a) and number-width diagram of the microburins (b) (*drawn by P. Biagi*).

3.3 Refitting (E.S.)

The method of refitting the chipped stone artefacts (CAHEN, 1987) has been applied to the assemblage with the aim of reconstructing the possible production sequences. The results have also been spatial analysed, in order to check the presence of specialized activity areas. The method and the area of the excavation made the assemblage suitable for such a type of analysis. It has been carried out following the theory, terminology and graphic symbology suggested by CZIESLA (1990a), i.e. using connection-lines as graphic indicators of the production sequences and of the modifications regarding their technological reduction-sequence. Therefore, the kinds of refits have been distinguished as follows:

1) refitting artefact in a production sequence, i.e. the reconstruction of core reduction sequences;
2) refitting broken artefacts (intentional or non intentional);
3) refitting products of artefact modifications i.e. preparation, retouching and resharpening of tools.

The first step has been to subdivide the artefacts according to the raw material groups and the category (cores, decortication products, flakes, blades, retouched artefacts). During this step, all the artefacts from the site were considered, including also, the unmapped pieces from the surface collection and from the sieving operations. It was immediately clear that the different varieties of flint were represented by different assemblages of artefacts and at different stages of exploitation. In fact, some groups were only composed of finished artefacts, probably brought into the site already in such a form; in this case no refitting was possible.

The second step has been to distinguish the categories of refittings as in the following table 3:

Table 3

Refitting...	Number of all fitting artefacts		Number of all refitting-lines	
of primary production		58		59
flake with core	9		12	
blade with core	7		5	
blade with blade	19		17	
blade with Mb	21		24	
Mb with Mb	2		1	
of decortication and core preparation		28		24
flakes with flakes	28		24	
of broken artefacts		26		15
broken tools	3		2	
a core with a core	3		2	
blades	16		9	
flakes	2		1	
Mb	2		1	
Total		112		98

There is a high occurrence of primary production refittings (51.8%), i.e. the core reduction process to obtain blade products for the preparation of geometric armatures with the microburin tecnique. For this, very straight blades and bladelets were utilized. The refitting artefacts of the decortication and core preparation (25%) are represented by flakes. Finally the last 23.2% of conjoining pieces are broken artefacts, mainly unretouched blades (61.5%).

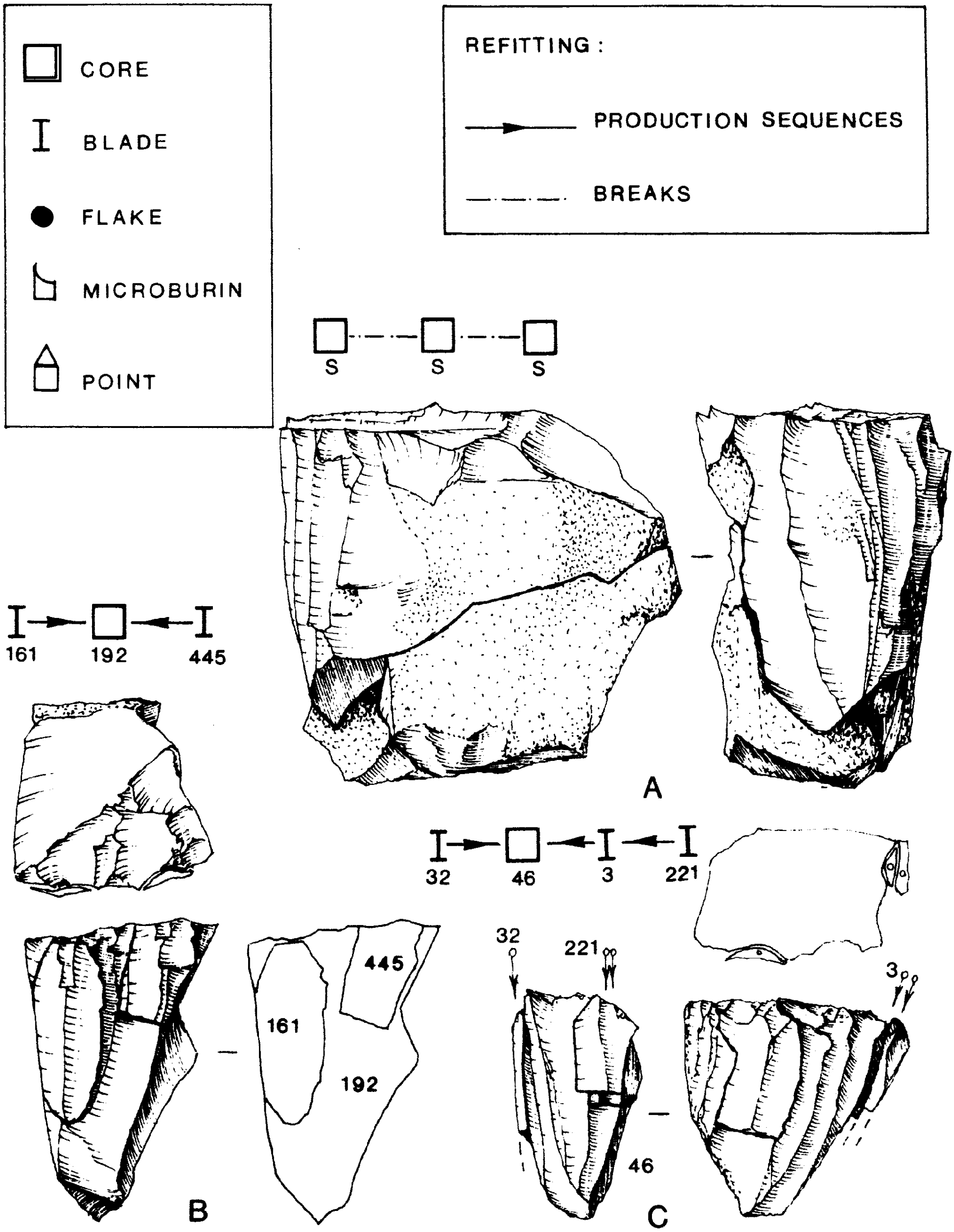


Fig. 20 – Laghetti del Crestoso: refitting of broken core (A) and of primary production: blades with cores (B and C) (1:1) (*drawn by G. Almerigogna and E. Starnini*).

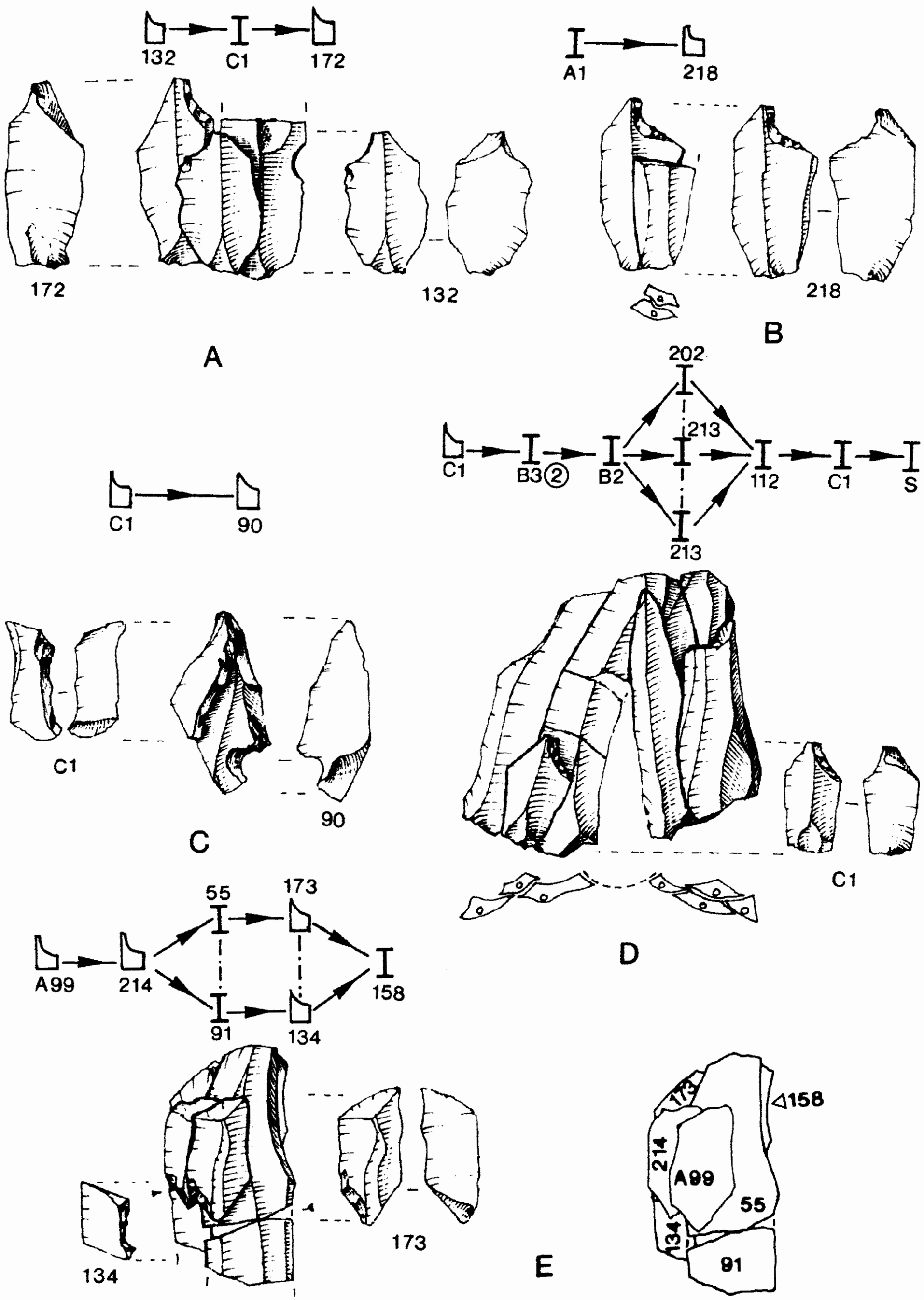


Fig. 21 – Laghetti del Crestoso: refitting of primary production: blades with microburins (A-E) (1:1) (*drawn by G. Almerigogna and E. Starnini*).

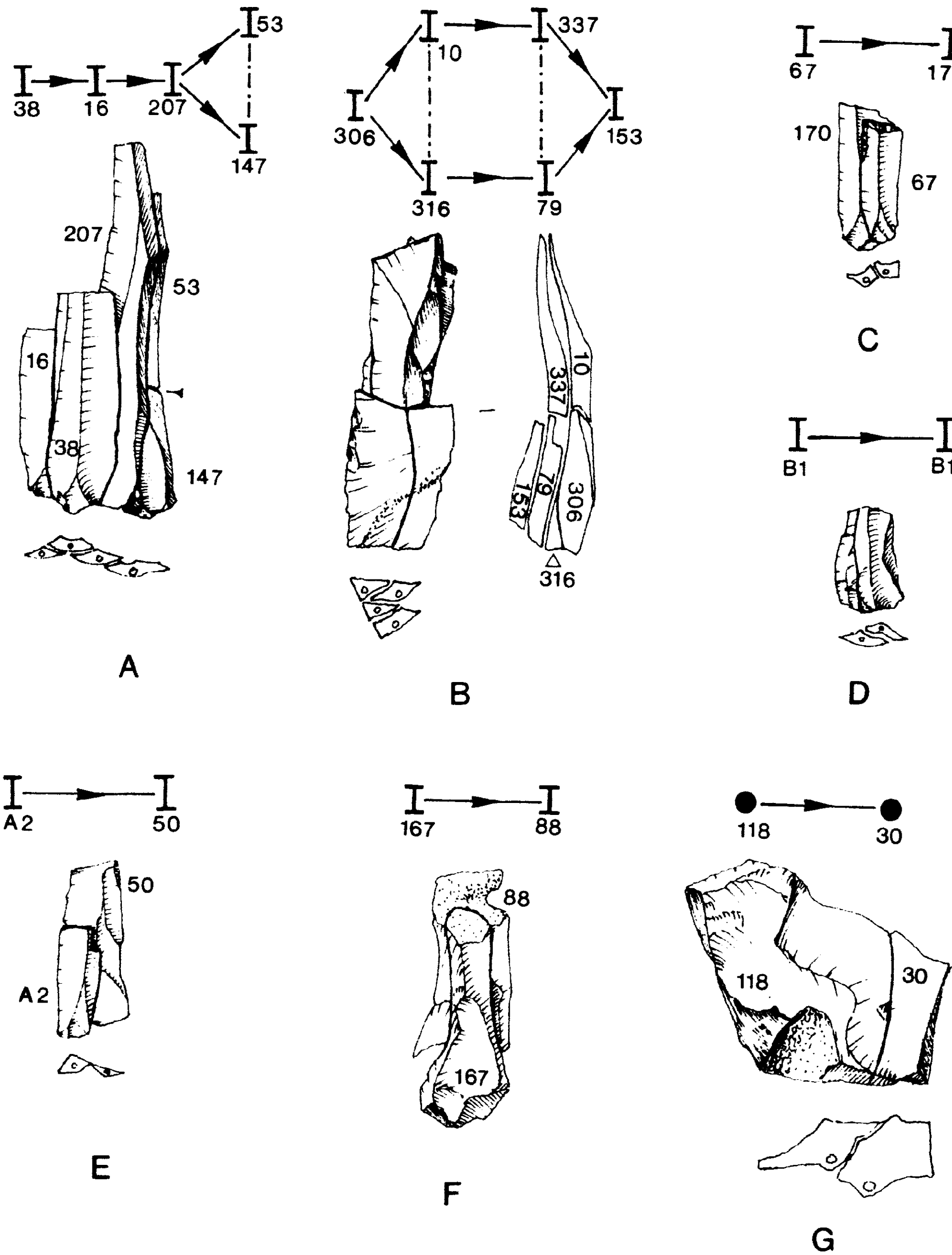


Fig. 22 – Laghetti del Crestoso: refitting of primary production: blades with blades (A-F) and of core preparation: flake with flake (G) (1:1) (*drawn by G. Almerigogna and E. Starnini*).

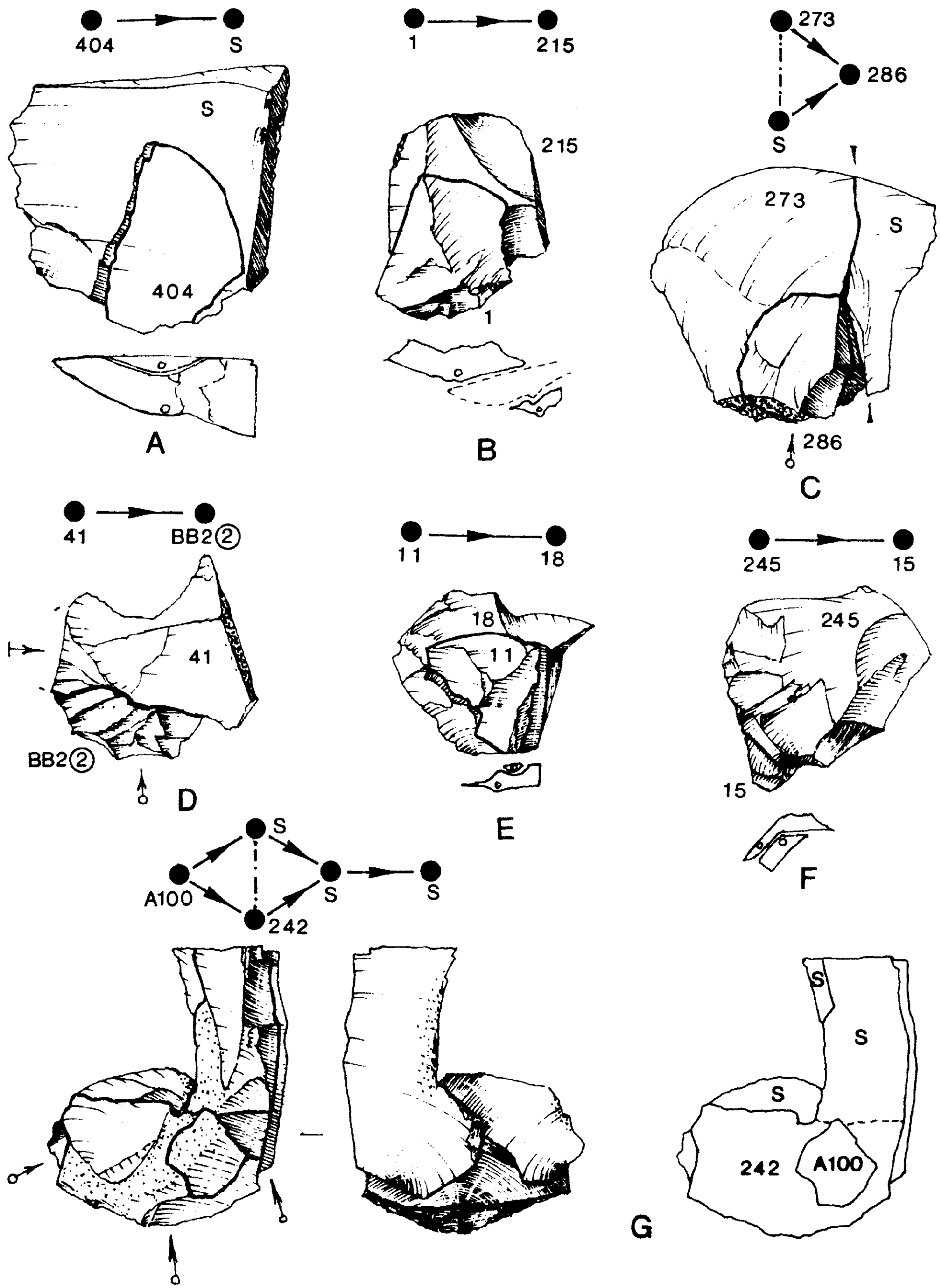


Fig. 23 – Laghetti del Crestoso: refitting of decortication and core preparation: flakes with flakes (A-G) (1:1) (*drawn by G. Almerigogna and E. Starnini*).

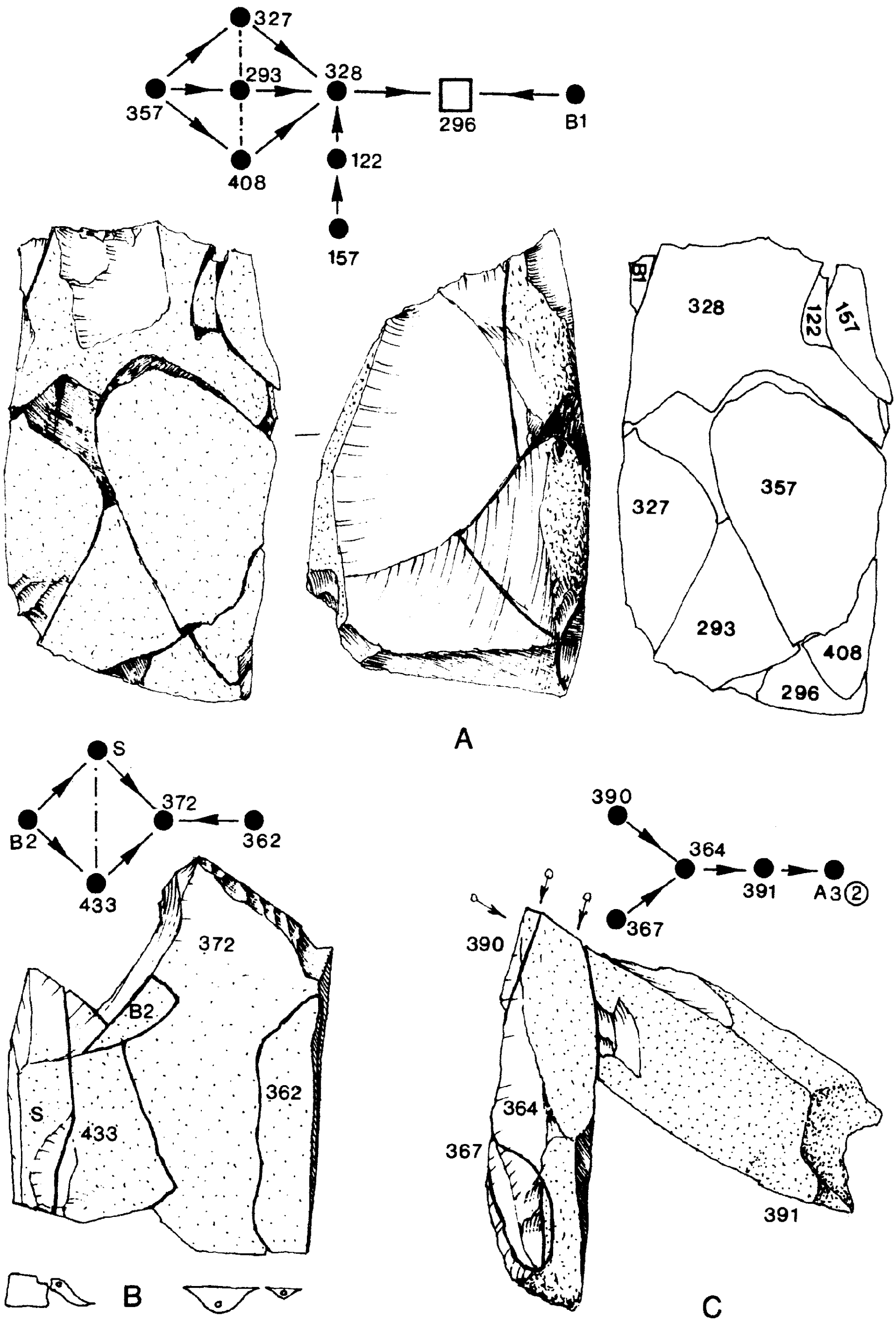


Fig. 24 – Laghetti del Crestoso: refitting of decortication and core preparation: flakes with pre-core (A), flakes with flakes (B and C) (1:1) (*drawn by G. Almerigogna and E. Starnini*).

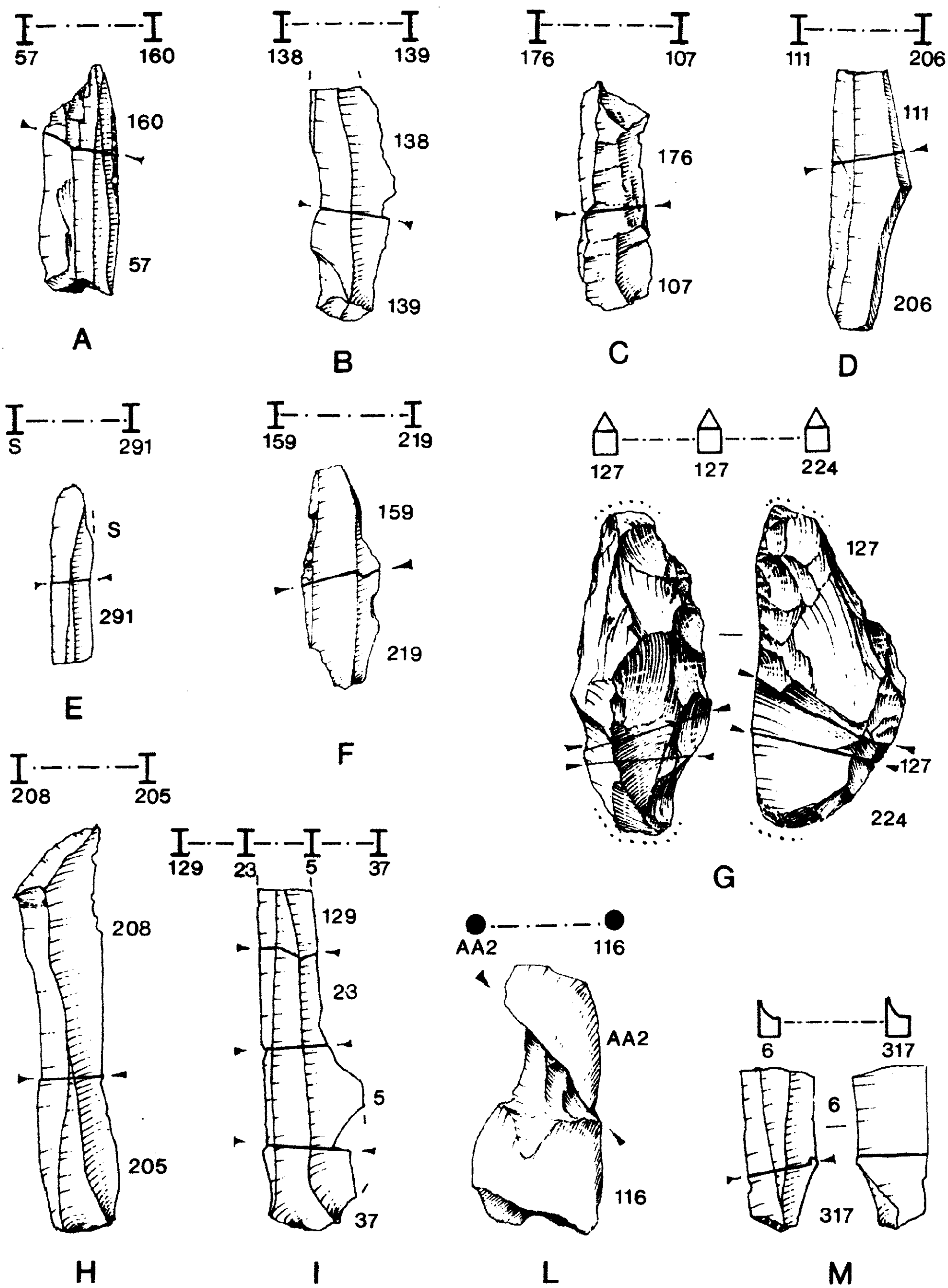


Fig. 25 – Laghetti del Crestoso: refitting of broken artefacts (A-M) (1:1) (*drawn by G. Almerigogna and E. Starnini*).

Concerning the refitting complexes, there are 36 in total. As shown in table 3, most of the conjoining artefacts can be referred to the primary production, in this case the striking of blades and bladelets from subconical cores; the involved complexes are 13 (figs. 20/B and C; 21; 22/A-F). These are followed in number by the refitting of broken artefacts, which includes 12 complexes (figs. 20/A; 25). Most of these are broken blades or bladelets; only one case is a broken tool, namely a «fabricator» used for retouching (fig. 25/G). The last group is that of the decortication and core preparation refitting flakes which involves 11 complexes (figs. 22/G; 23; 24). It should be emphasised that there are no conjoining of artefact modifications, that is, the preparation and the resharpening of tools. However, it is quite evident that the chipping activity was mainly devoted to the production of laminar blanks from which geometric armatures were prepared with the microburin technique. Thus, the lack of refitting of artefact modifications can be due to the following causes:

a) to the fact that the excavated portion of the site does not comprise this activity area;
b) to the short-term occupation character of the site, in which very few and very specialized activities were performed, involving a limited variety and number of stone tools;
c) all the attempts at producing geometric armatures were successful and in this case, we can explain the lack of microburins refitting with corresponding trapezes.

Moreover, the presence in the site of some trapezes obtained with varieties of flints that are no longer represented by other products together with a number of microburins much higher than that of the trapezes chipped from the same raw material, would suggest the replacement of the flint armatures in the arrows.

The refitting rate of this assemblage is 17.9%, that is, a medium-high value in comparison to the table published by Cziesla (1990a). However, all the observations pointed out by the same Author in evaluating the refitting rates should be taken into consideration (Cziesla, 1990a: 24-26).

3.4 Spatial analysis (E.S.)

The precise location of the finds recorded during the excavations (figs. 26; 27) and the refitting of the pieces (fig. 28), permit an evaluation of the intra-site events (Cziesla, 1990a: 17). In particular, the position of the pieces that form each single refitting complex, the distance and the directions of the flint artefacts and their conjoining-lines can be used as indicators of the movements and the technical procedures, also providing a basis for the analysis of settlement dynamics (Cahen, 1987). In this perspective, only those pieces that have been precisely recorded with coordinates during the excavation have been considered. This excludes pieces which, even though refitted, come from surface collection and those obtained from the sieve. The latter only have the square of provenance, but not the coordinates. All the single pieces of each refitting complex have been positioned on the map of fig. 28 and have been connected by lines according to the different refitting types mentioned above. Following the standardised set of symbols suggested by Cziesla (1990a: 17), the refitting of production-sequences have been indicated by connection-lines with arrows pointing to the direction of production. On the contrary, the refitting of the broken artefacts is marked by interrupted, arrow-less lines, since the intentionality of the breaks cannot be demonstrated.

As represented by the histogram of fig. 29/C, the majority of the connection-lines conjoin pieces in a production-sequence (43 lines=67.2%), whilst breaks correspond to 21 connection-lines (32.8%).

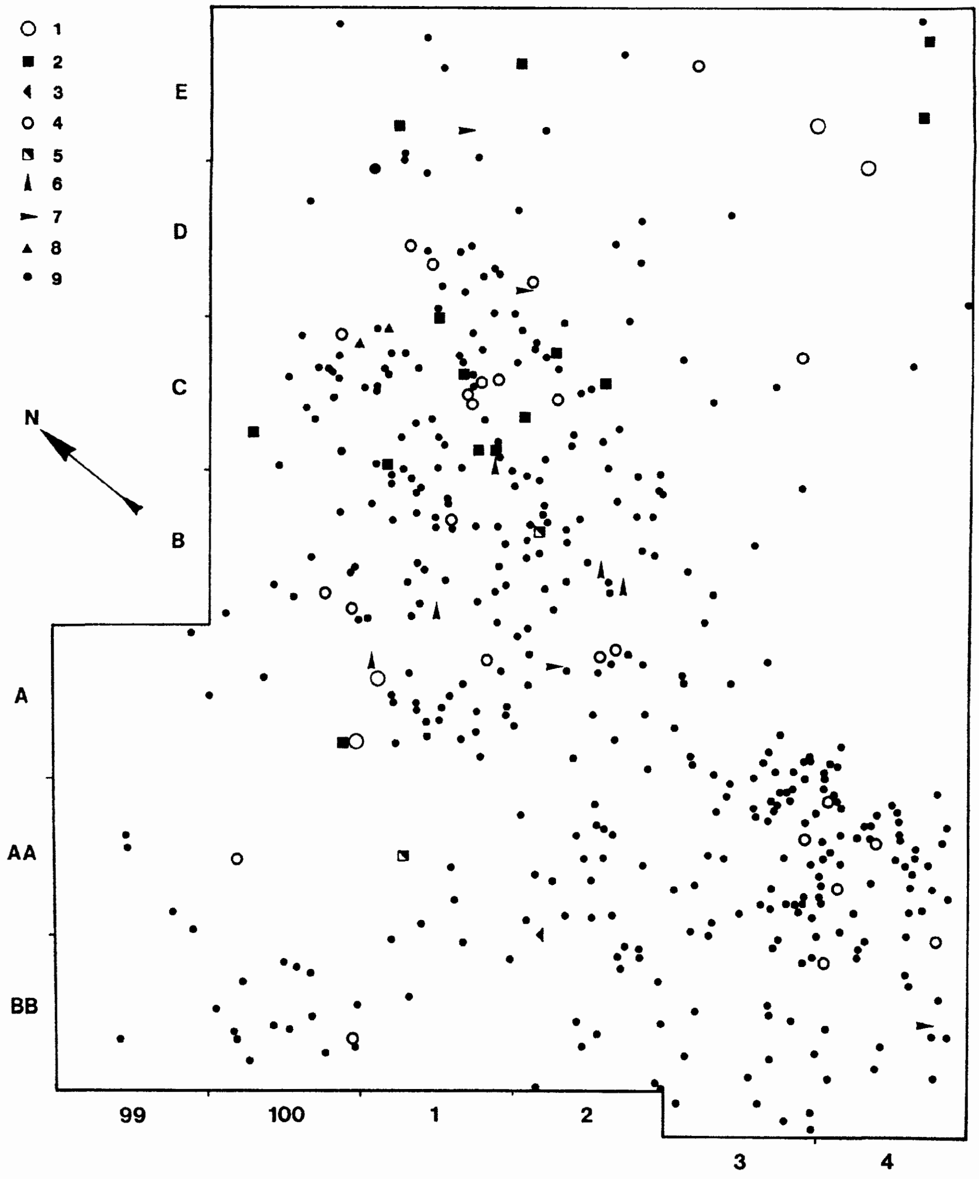


Fig. 26 – Laghetti del Crestoso: distribution map of the lithic artefacts. 1) cores, 2) trapezes, 3) triangles, 4) microburins, 5) truncations, 6) retouched blades, 7) crested blades, 8) fabricator, 9) debitage (*drawn by P. Biagi*).

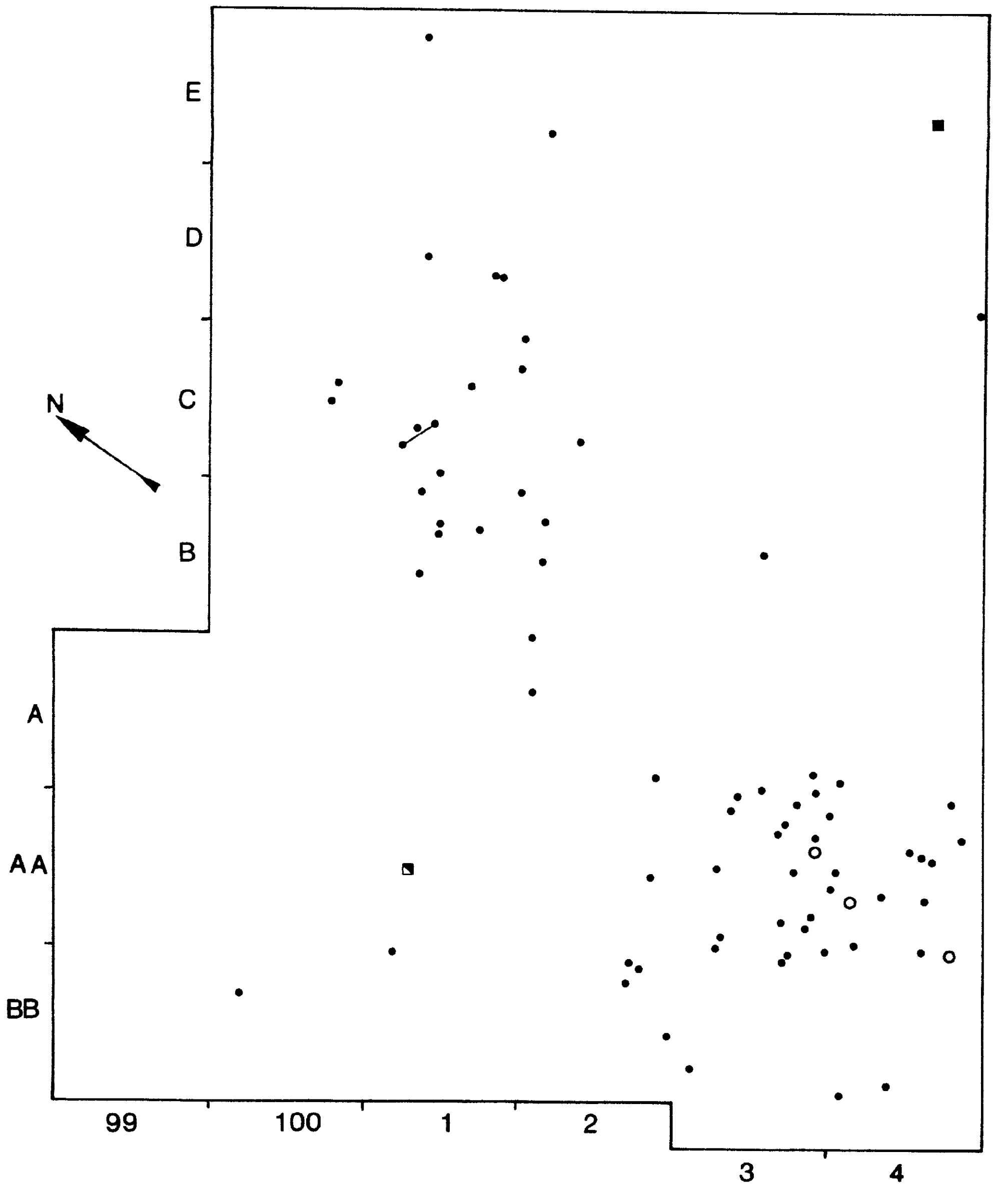


Fig. 27 – Laghetti del Crestoso: distribution map of the burnt artefacts (for symbols see fig. 26; line conjoins refitting pieces) (*drawn by P. Biagi*).

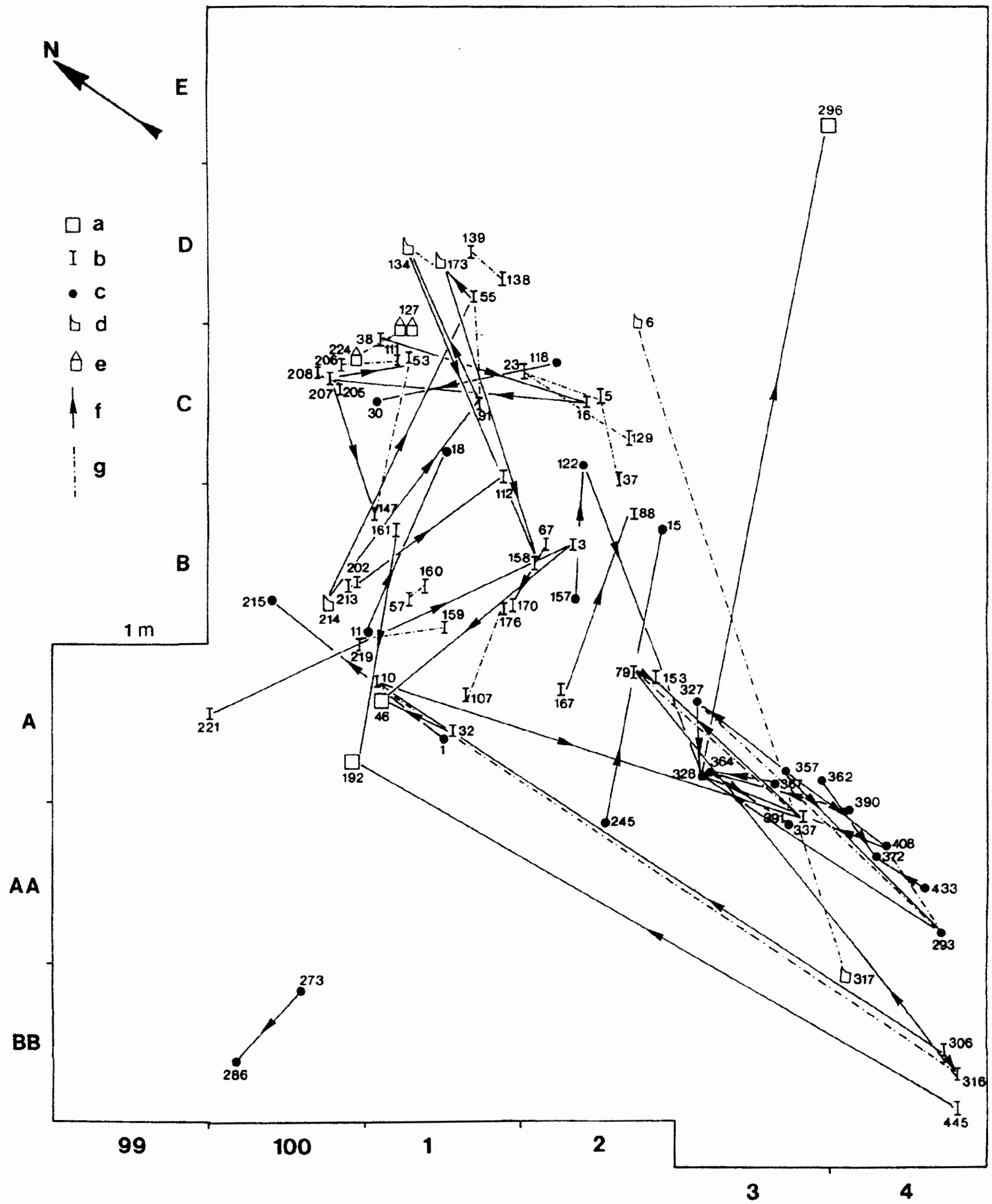


Fig. 28 – Laghetti del Crestoso: distribution map of the refitting pieces. a) cores, b) blades, c) flakes, d) microburins, e) fabricator fragments, f) refitting of production sequences, g) refitting of breaks (*drawn by E. Starnini*).

According to the lengths of the connection-lines, four distance-groups have been considered:
1 – short, between 0 and 0.50 m;
2 – medium, between 0.51 and 2 m;
3 – long, between 2.1 and 4 m;
4 – very long, more than 4 m.

Of the 64 conjoining lines, 21 (=32.8%) are short, 34 (=53.1%) medium, 4 long (=6.3%) and 5 very long (7.8%) (fig. 29/A-B).

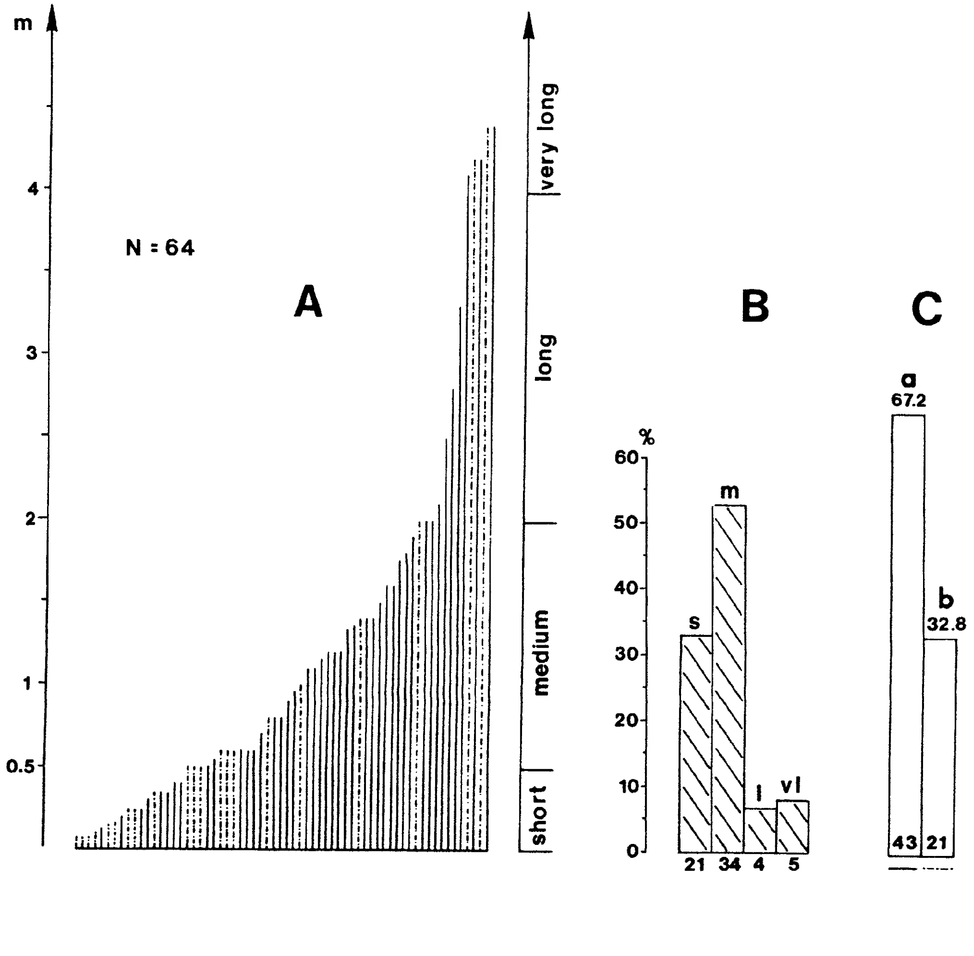


Fig. 29 – Laghetti del Crestoso: A) lengths of the refitting-lines differentiated according to types and ordered according to distances; B) percentages of the refitting-lines according to four groups of distances (s=short, m=medium, l=long, vl=very long); C) number and percentages of refitting types (a=production sequences, b=breaks) (*drawn by E. Starnini*).

Most of the lines connecting the refitting pieces fall into medium-short distance values (=85.9% of the lines), that indicate a small disturbance of the site. However, the long and very long connecting-lines follow the direction of the slope as can be seen from fig. 5.

Comparing our data with those obtained from other European sites studied with the same method (Cziesla, 1990a: 31-33), we can observe values similar to the general trend. It shows that breaks are rarely conjoined at long distance and that the production sequences have distances up to 2.1 m, reflecting the usual dispersion rate of the so-defined «ground production», as proven by experimental works (Fischer *et al.*, 1979).

Finally, the typology of the refitted pieces from squares B-C-D/100-1-2, clearly indicates that the preparation of the trapezoidal armatures took place in this area, which corresponds to the periphery of all the features recovered (fig. 6) and to the gentler part of the slope.

3.5 Observations on the distribution of the artefacts according to raw material types (E.S.)

All the artefacts recorded *in situ* have been positioned on thematic maps according to the raw material groups identified (see Chapter 3.1). However, only the maps with at least 15 or more artefacts seem to be significant: these latter concern respectively the distribution of the flint types F1, F3-F5 and F7 (figs. 30-34); in fact the other flint types are represented by too low number of pieces to allow any consideration of their distribution patterns. The artefacts chipped from flint type F1 are distributed along a N-S axis; they are mainly laminar debitage and microburins. Among these several pieces have been refitted, although no cores were found (fig. 30).

The chipped artefacts obtained from the flint types F3 and F4, show a sparser and more scattered distribution, all over the excavated area. In these two cases, the presence of the respective cores is to be noted, along with some refitting products (figs. 31; 32).

On the contrary, the distribution maps of flint types F5 and F7 display a different pattern: in these cases, the artefacts are much more clustered in squares B-D/100-2, at the southern edge of Fireplace 1 (figs. 5; 33; 34). In both cases, the best represented artefact category, besides laminar debitage, is that of the microburins.

From the typological point of view, flint types F1, F5 and F7 are represented by *piquant trièdre* trapezes (F7=fig. 17/13, 17, 18 and 21) and truncations (F7=fig. 17/6) as well as larger-sized microburins (F1=figs. 18/14; 21/B; F5=fig. 21/E; F7=figs. 18/7; 21/A; 25/M) (see also Appendix 2).

Since it is generally assumed as a rule that raw materials which show the greatest spatial clustering might have been worked immediately before the abandonment of the site (Cziesla, 1990a: 31), in our case, the maps of figs. 33 (F5) and 34 (F7) should represent the last occupational phase at the site. It is to be underlined that this is in accordance with the ^{14}C date obtained from Hearth 1, south of which these two scatters of artefacts cluster.

An earlier phase of settlement should be reflected by the maps of figs. 31 and 32 (flint types F3-F4) which show, on the contrary, a very sparse distribution of artefacts and longer conjoining lines. They can be interpreted as distributions of artefacts dispersed by later settlement events (Winter, 1990: 491). What is to be noted, is that these two maps (figs. 31 and 32) differ from the others also for the typology of the instrument. In fact, both raw material types F3 and F4 are represented by small subconical cores (F3=fig. 20/C; F4=fig. 20/B), isosceles trapezes with retouched, oblique truncations (F3=figs. 17/26, 27 and 29; F4=figs. 17/25 and 28), the hypermicrolithic triangle of fig. 17/10 (F3) and small microburins (F3=fig. 18/20);

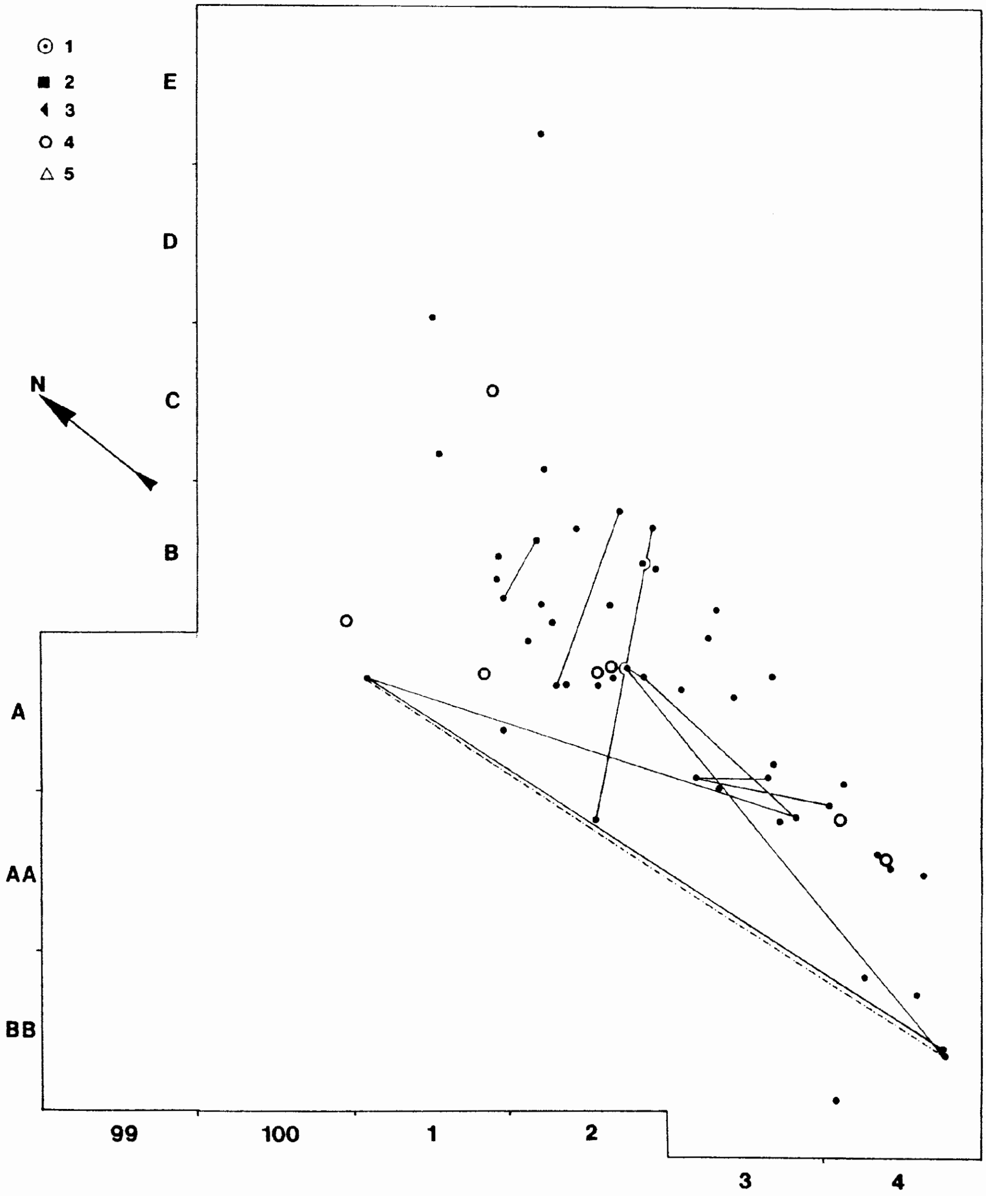


Fig. 30 – Laghetti del Crestoso: distribution map with refittings of the artefacts chipped from flint type F1 (symbols: 1) cores, 2) trapezes, 3) triangles, 4) microburins, 5) truncations. Black dots represent unretouched artefacts) (*drawn by E. Starnini*).

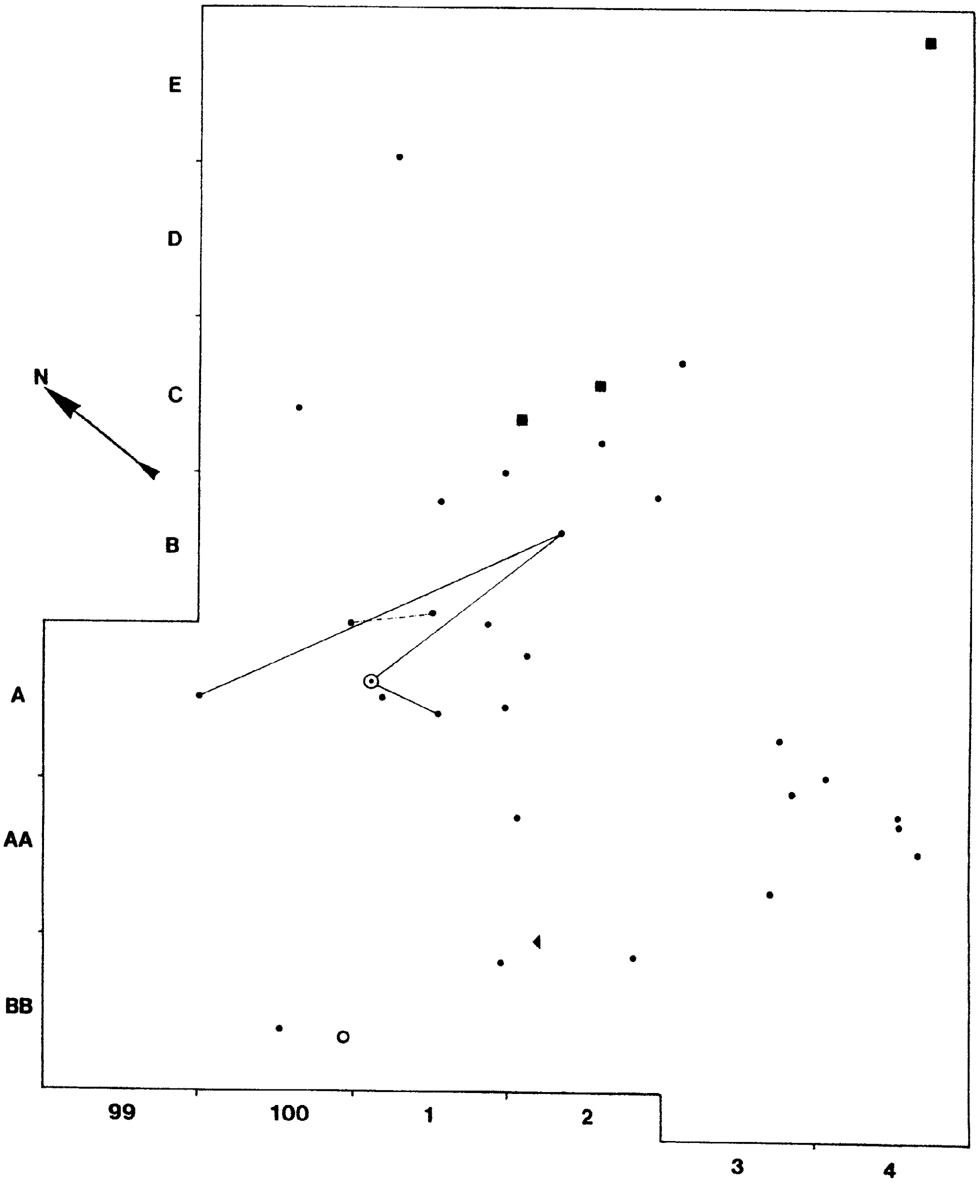


Fig. 31 – Laghetti del Crestoso: distribution map with refittings of the artefacts chipped from flint type F3 (for symbols see fig. 30) (*drawn by E. Starnini*).

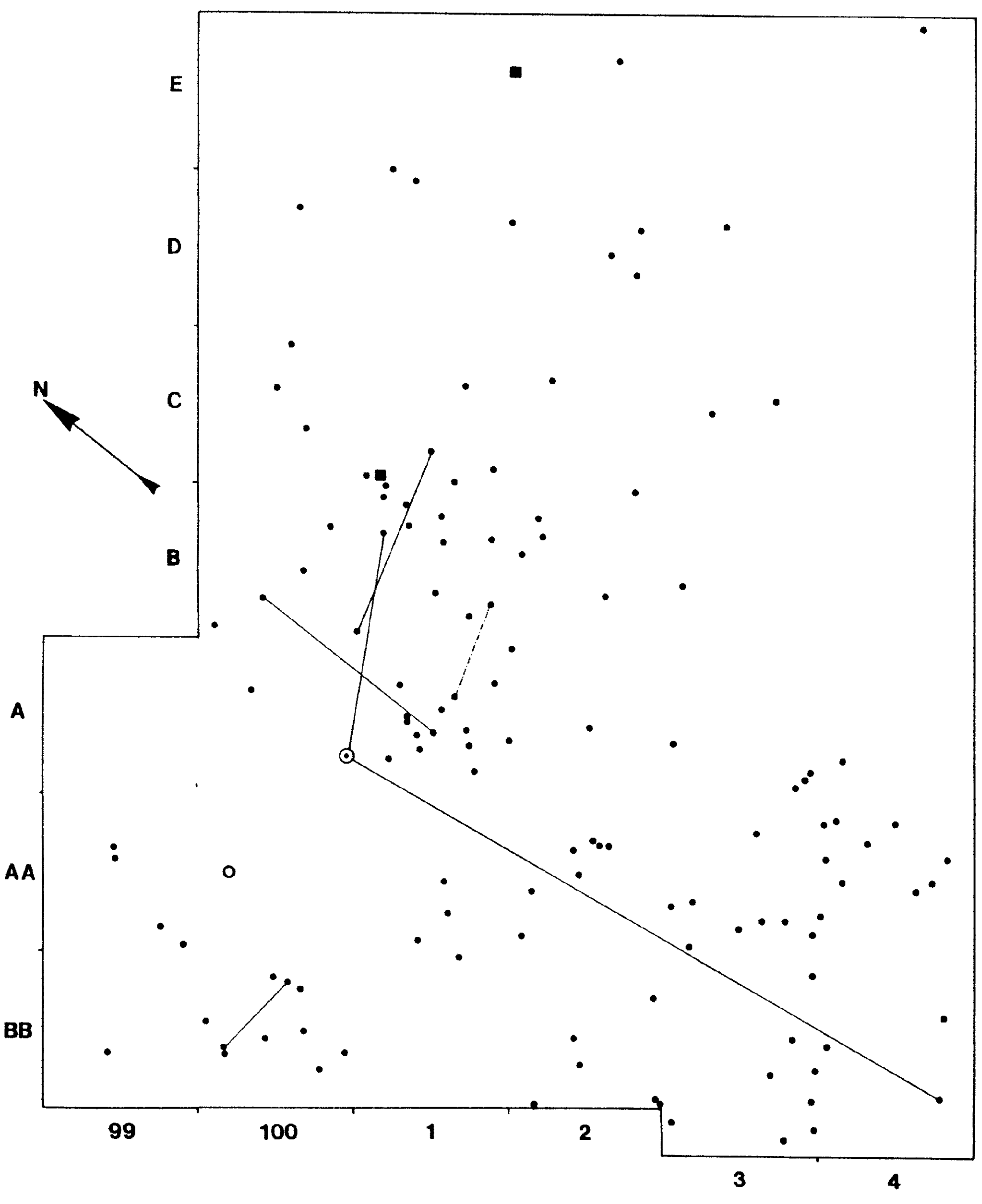


Fig. 32 – Laghetti del Crestoso: distribution map with refittings of the artefacts chipped from flint type F4 (for symbols see fig. 30) (*drawn by E. Starnini*).

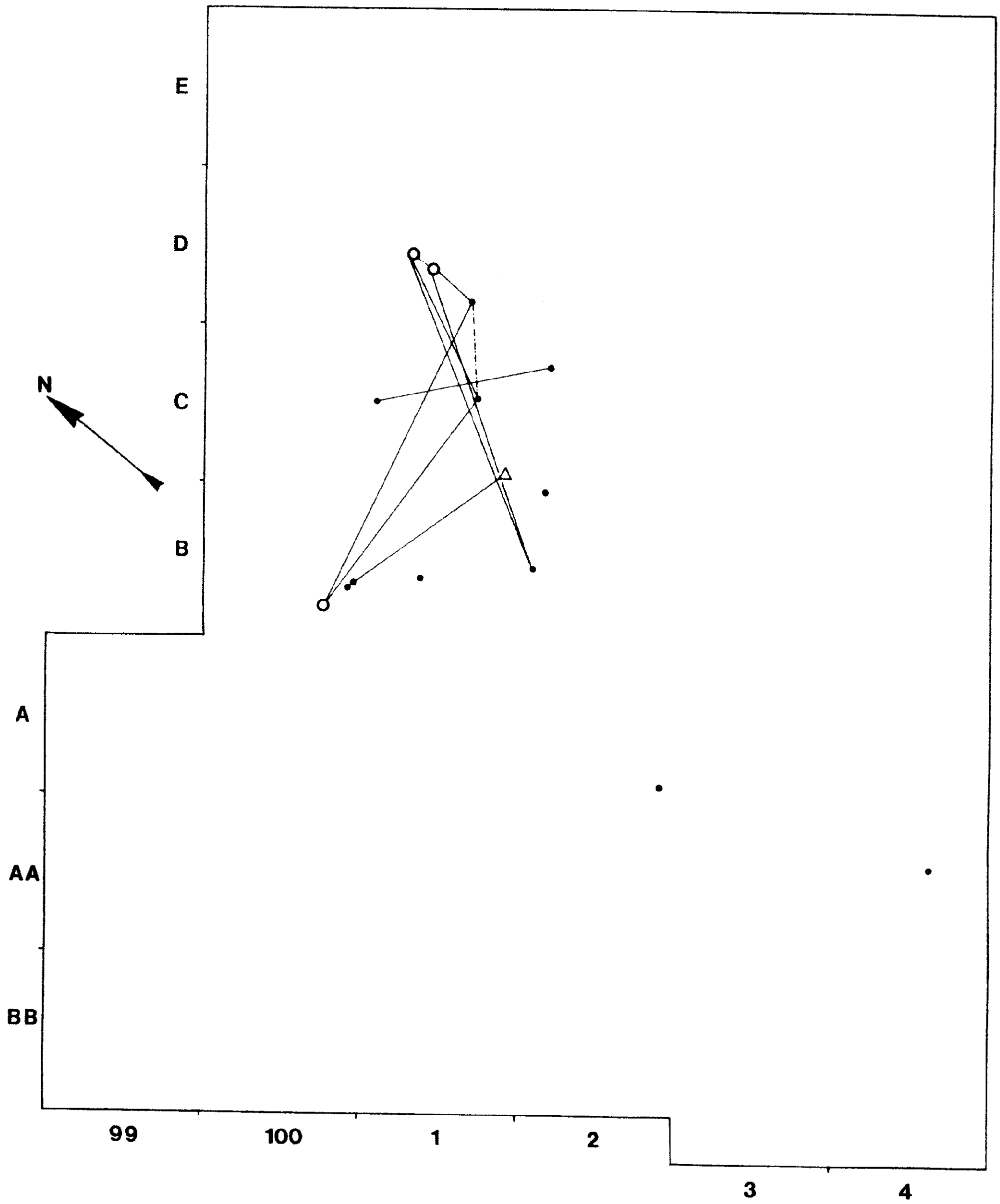


Fig. 33 – Laghetti del Crestoso: distribution map with refittings of the artefacts chipped from flint type F5 (for symbols see fig. 30) (*drawn by E. Starnini*).

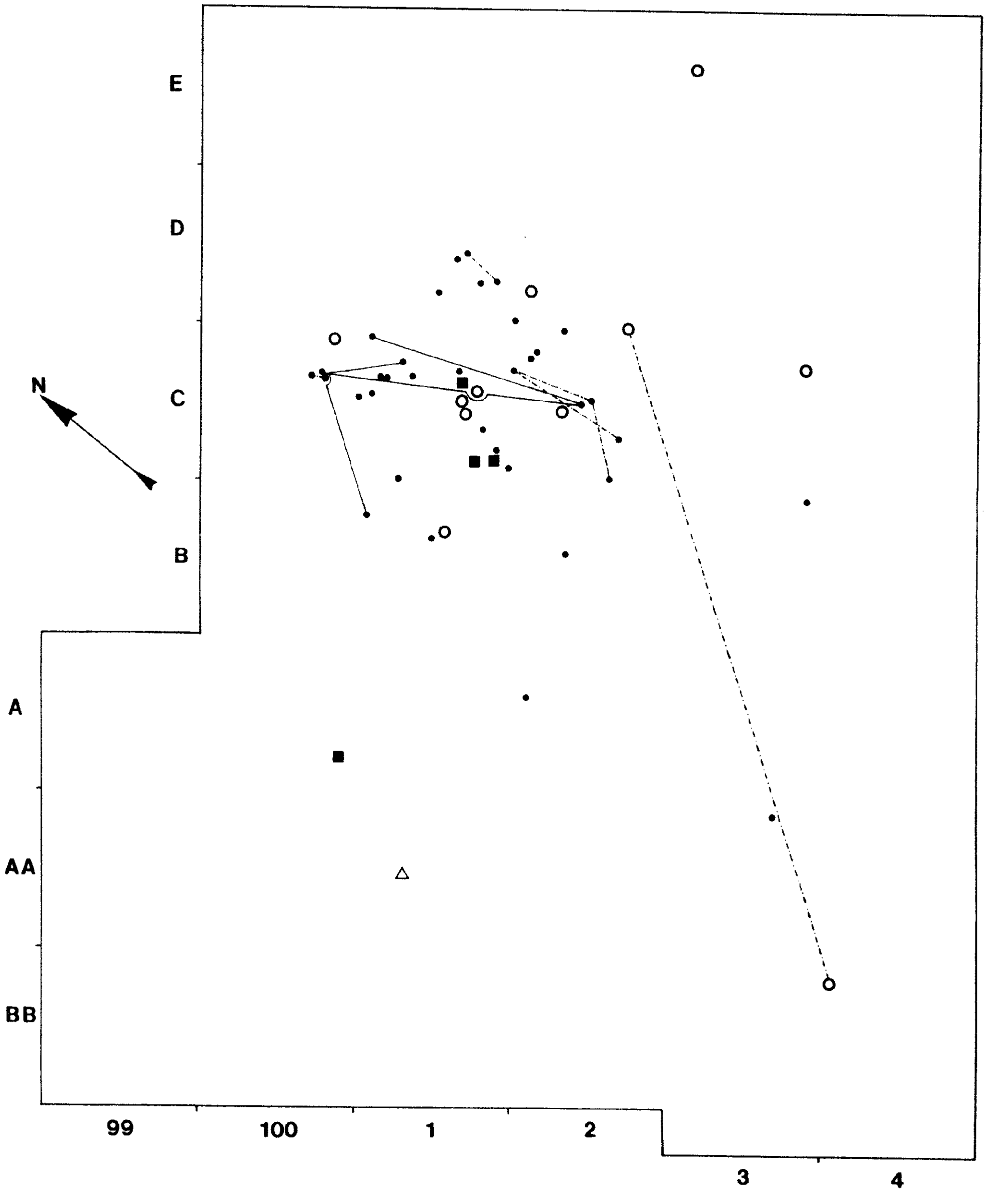


Fig. 34 – Laghetti del Crestoso: distribution map with refittings of the artefacts chipped from flint type F7 (for symbols see fig. 30) (*drawn by E. Starnini*).

All these characteristics point to a different chronology of these two assemblages and perhaps they are in accordance with the oldest ^{14}C dates obtained from the site (cfr. Chapter 2.3).

To conclude, the example of Laghetti del Crestoso demonstrates how the combination of spatial analysis and refitting of artefacts can contribute to solving the problem of contemporaneity of flint assemblages of short-term camps.

In fact, in this case, as already pointed out by CZIESLA (1990b: 596-598), no other method like typology, chronology or radiocarbon dating, is able alone to solve the problem.

3.6 A functional approach through trace wear analysis (C.L.)

The flint assemblage has been studied from a functional point of view with the analysis of both macro-wear and micro-wear traces. The «working edge» of each tool with traces of wear has been described in detail. The length and edge-angle of each diagnostic edge has been measured, while also, their edge-shape and cross section has been considered. A detailed description of the function of each tool is presented here along with a brief description of the method employed for the analysis.

3.6.1 Methodology

The macro-traces are produced by use along the edges and/or the ends. They can be the result of hafting or accidents occurred during the manufacture of the instruments or due to post-depositional modification (HAYDEN, 1979; FISCHER *et al.*, 1984; LAWRENCE, 1979; ODELL and COWAN, 1986; TRINGHAM *et al.*, 1974). The micro-traces, both polishes (MOSS, 1983: 15-18) and striations (MOSS, 1983: 74-76), can be caused by use, hafting, manufacture (3) and post-depositional agents (KEELEY, 1980; MOSS, 1983; MOSS and NEWCOMER, 1982; UNRATH *et al.*, 1986). The macro-traces have been observed with a stereomicroscope (Wild M5: magnification from 6x to 50x) and the micro-traces with a microscope (Nikon Optiphot-pol) in reflecting light (eye-pieces 10x and lenses Leitz UN 10x, Nikon CFM Plan Acromat 20x, 40x).

The macro and micro-wear analysis has not been conducted on the debris, the surface finds, the artefacts not recovered *in situ* and the burnt pieces; while the micro-wear study has not been conducted on the artefacts with chemical/mechanic surface modifications (LEMORINI, 1989; LEVI SALA, 1986; PLISSON, 1985; 1986).

The artefacts considered are 133 in total, including 16 microburins examined to verify whether their utilisation took place before or after the manufacture of the geometrics. 15 artefacts show macro and/or micro-traces caused by utilisation (10), hafting (3) and manufacture (3); their distribution is shown in fig. 35.

The following table 4 is a brief description of the traces (4) observed on the above-mentioned artefacts as well as of their functional interpretation.

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(3) The micro-traces of manufacture are polish lines and striations caused by hard or soft hammering or the retouch of the flint on the impact point (platform or profile). I have not tried to reproduce experimentally such microtraces by using a flat retouch.

(4) The terminology employed in the description of the macrotraces is that of HAYDEN (1979) and FISCHER *et al.* (1984). The analysis of the macro-traces alone does not allow the specific evaluation of the material worked. It only gives a general attribution to the use of medium-hard (medium-fresh skin, wood and grasses), or hard (skin, hard wood, bone, antler, shell and stone) materials.

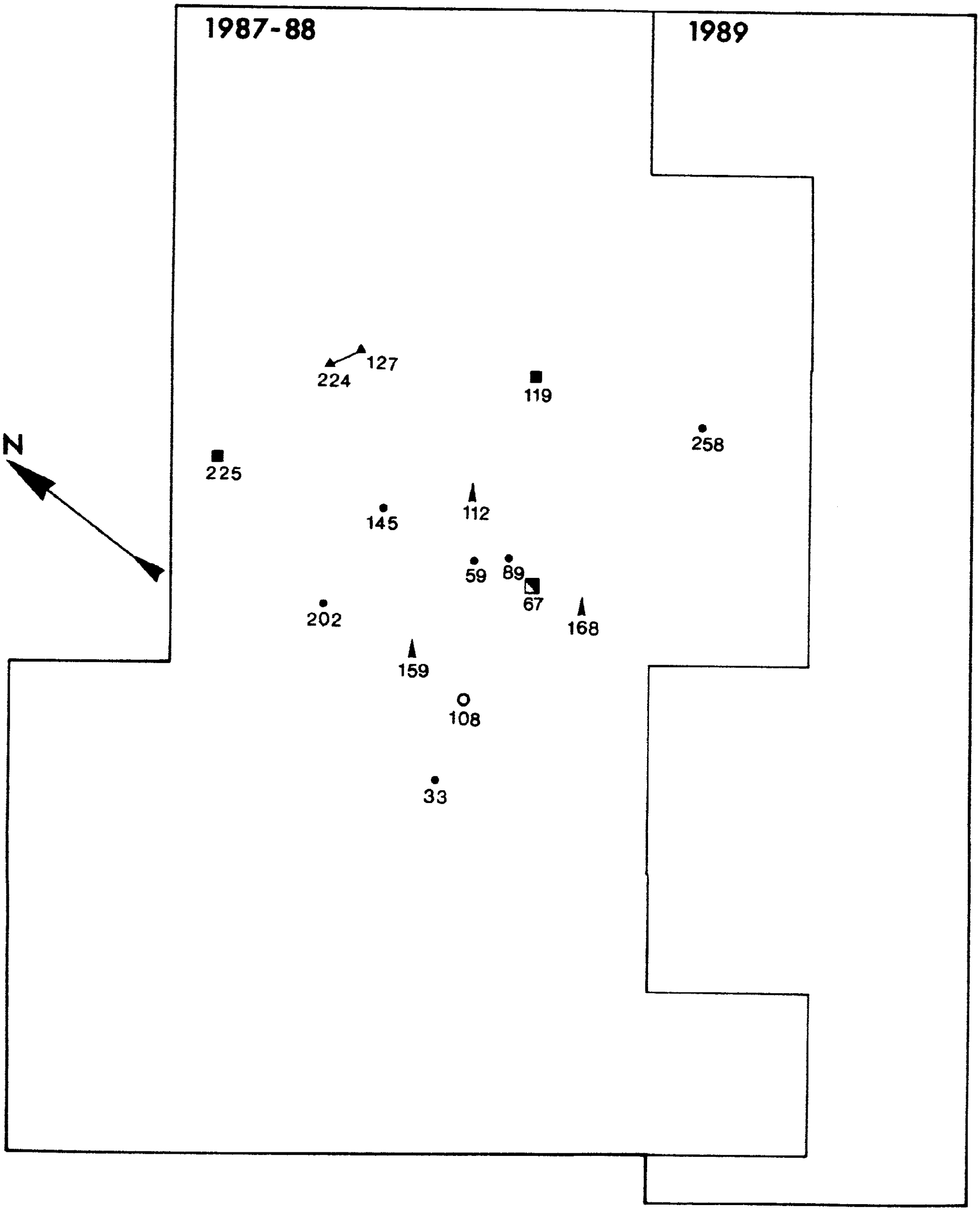


Fig. 35 – Laghetti del Crestoso: distribution map of the artefacts with traces of wear (for symbols see fig. 26) (*drawn by P. Biagi*).

Table 4

Tool	Wear traces		Function
Trapeze 225 figs. 36/1; 38/a and b	Macro: Micro:	bending+step scars lines of polish	impact
Trapeze 119 figs. 36/2; 40/d	Micro:	line of polish along the edge	hafting
Bladelet 89 figs. 36/3; 38/c and d	Macro: Micro:	bending+step scars (1 mm) lines of polish+striations	impact (point)
Retouched bladelet 112 figs. 36/4; 39/a and b	Micro:	lines of polish+striations parallel to the edge;	impact (barb)
		lines of polish+striations transverse to the edge	manufacture
Microburin 108 fig. 36/5	Macro:	bending+step scars (1.5 mm)	impact (point)
Bladelet 145 figs. 36/6; 39/c	Micro:	lines of polish along the entire edge	cut meat
Blade A99 figs. 36/7; 39/d	Macro: Micro:	bending+step scars line of polish along the edge	cut meat
Bladelet 202 fig. 36/9	Macro: Micro:	bending+feather/step light polish along the edge	cut semi-hard
Bladelet 168 figs. 36/10; 40/a and b	Macro: Micro:	bending+step scars light polish along the edge	groove wood
	Macro: Micro:	bending+step/feather crushing line of polish along the edge	hafting in wood
Bladelet 33 fig. 36/8	Macro:	bending scars	cut semi-hard
Retouched bladelet 159 figs. 37/11; 40/c	Micro:	lines of polish+striations and band of polish along the edge	hafting in antler or manufacture with antler tool
Bladelet 59 fig. 37/12	Micro:	lines of polish	manufacture
Truncation 67 fig. 37/13	Micro:	lines of polish	manufacture
Fabricator 127-224 fig. 37/14	Macro:	stippling at both ends	retouching hard material (flint)
Retouched blade 258	Micro:	band of polish along the edge	hafting in soft wood

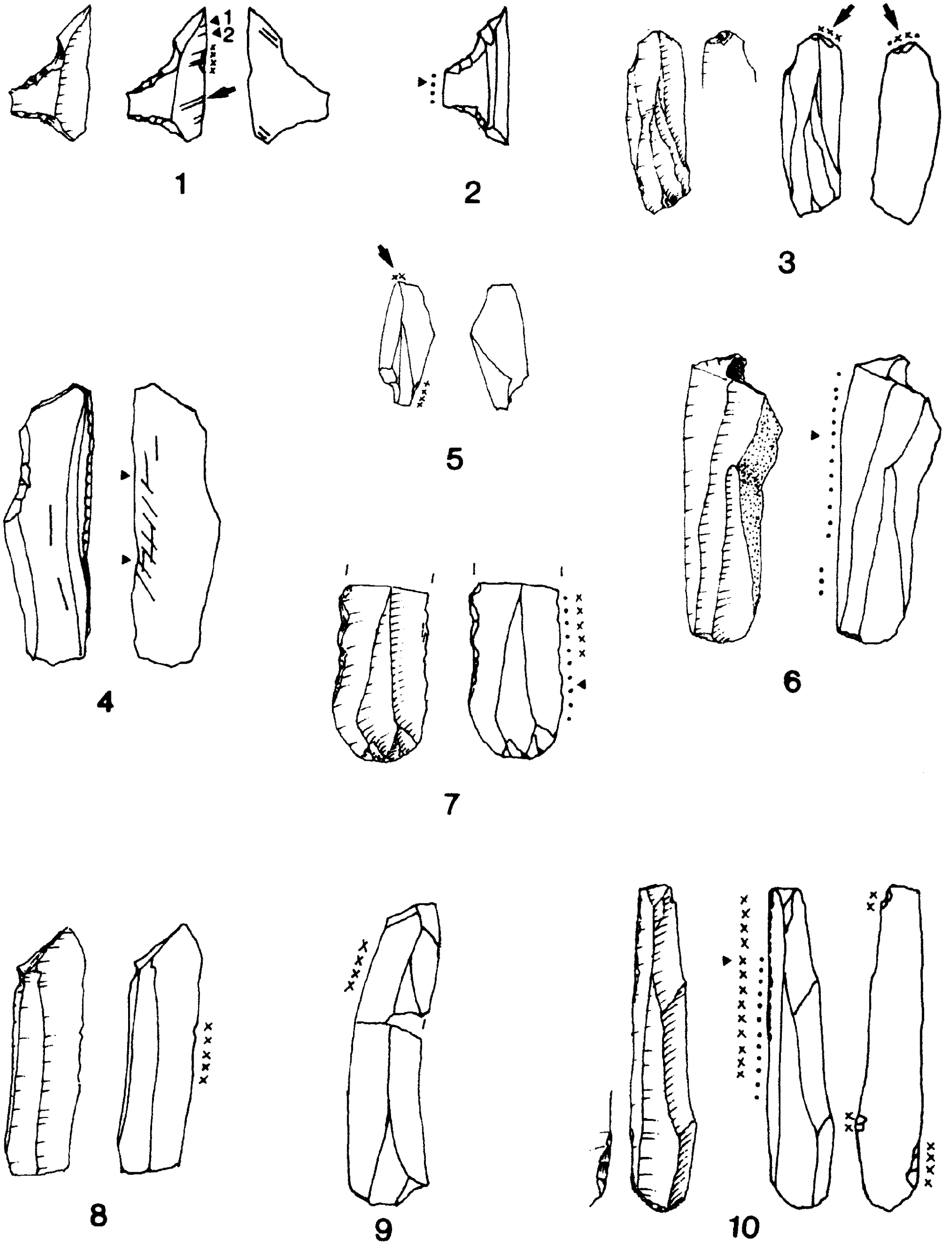


Fig. 36 – Laghetti del Crestoso: artefacts with traces of wear, hafting and manufacture. 1) trapeze 225, 2) trapeze 119, 3) bladelet 89, 4) retouched bladelet 112, 5) microburin 108, 6) bladelet 145, 7) blade from square A99, 8) bladelet 33, 9) bladelet 202, 10) retouched bladelet 168. Location of the micro-traces (....;——) and macro-traces (xxxx); micro-photographs (▶) and impact direction (↑) (1:1) (*drawn by G. Almerigogna, E. Starnini and C. Lemorini*).

3.6.2 The projectile points

14 geometrical trapezes have been analysed: 1 shows characteristic impact traces (figs. 36/1; 38/a and b), 5 have surface modifications that have prevented the analysis. All the other geometrics have no macro and/or microwear traces. This does not mean that they have not been used; in fact, as demonstrated by FISCHER *et al.* (1984), the armatures can remain intact after impact.

One of the geometrics without traces of wear has micro-traces caused by contact with an unidentifiable material: they can be interpreted as traces of hafting (figs. 36/2; 40/d).

Two blades have impact traces indicating they have been used as armatures. One has been used as a point (figs. 36/3; 38/c and d); the other as a barb (figs. 36/4; 39/a and b). The different interpretation is due to the variable position of the traces of wear in relation to the diverse impact zone. The point has lines of polish and striations that, from the distal end, reach the medium part

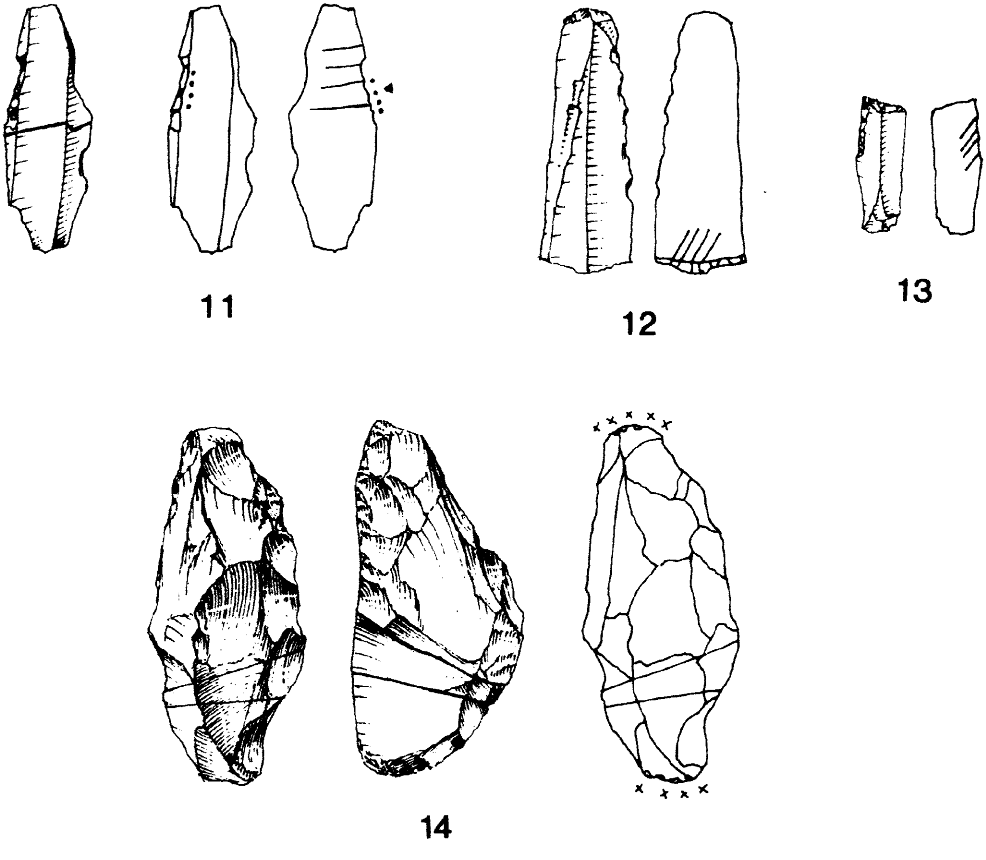


Fig. 37 – Laghetti del Crestosò: artefacts with traces of wear, hafting and manufacture. 11) retouched bladelet 159, 12) bladelet 59, 13) truncation 67, 14) point/fabricator 127/224). Location of the micro-traces (....;——) and macro-traces (xxxx); micro-photographs (▶) (1:1) (*drawn by G. Almerigogna, E. Starnini and C. Lemorini*).

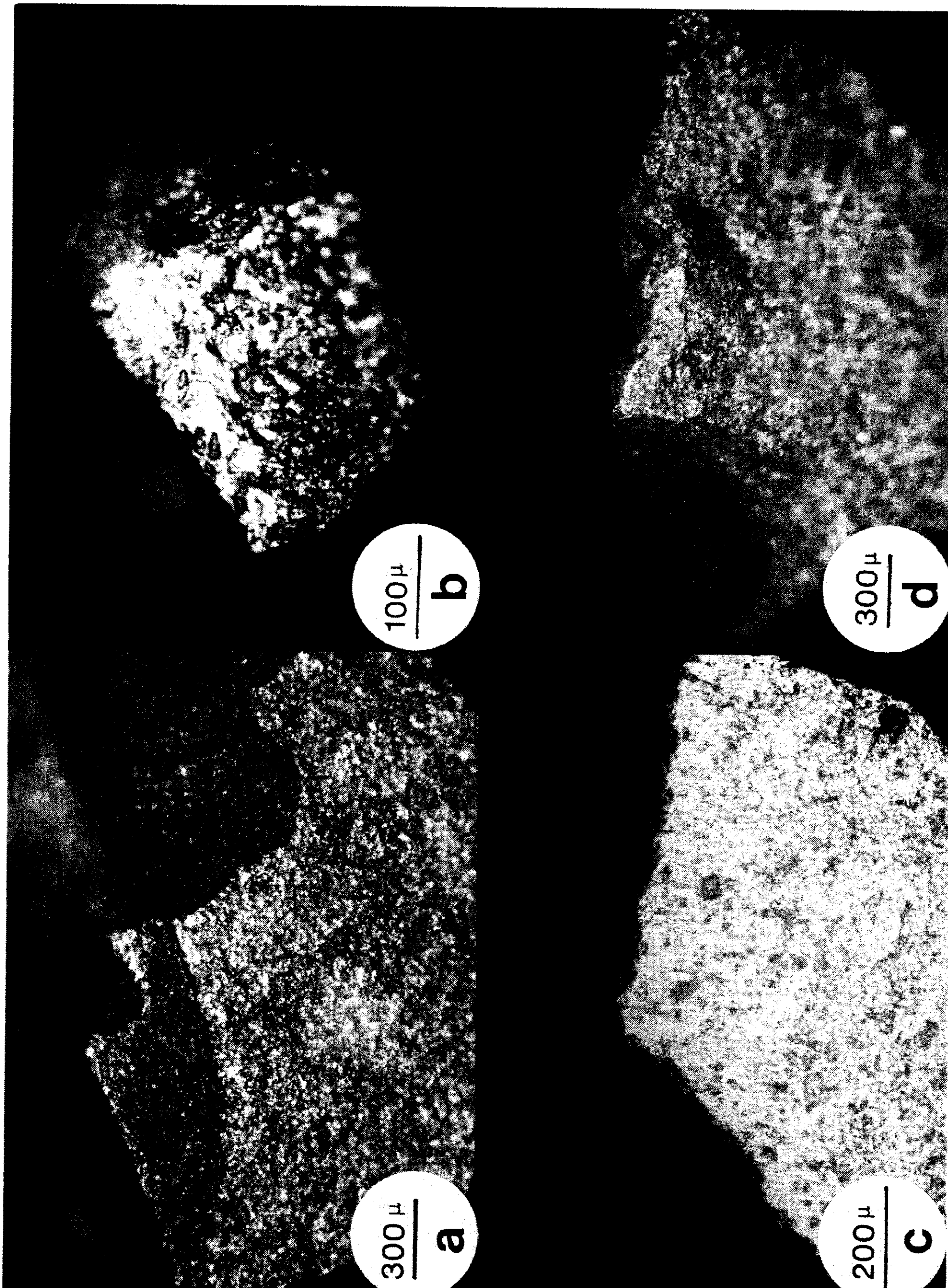


Fig. 38 – Laghetti del Crestoso: micro-photographs of trapeze 225 (lines of polish; impact: 100x) (a and b); bladelet 89 (lines of polish+striations; impact: 100x) (c); particular of photograph c (line of polish+striation: 400x) (d) (*photos by C. Lemorini*).

of the tool. Clear impact micro-traces are visible on the distal end. The barb shows polish lines and striations close and parallel to the retouched edge. Such traces, as demonstrated by the experiments of Moss and Newcomer (1982) indicate that the impact took place near the end with a direction parallel to it and consequently to the tool axis. Besides impact macrotraces, a few slightly transverse lines of polish are present on the ventral face of the barb, along the working profile. They are to be related to the manufacture of the retouch on the dorsal face of the same instrument.

It has been impossible to determine if the impact macro-traces precede the manufacture or *vice-versa*. Nevertheless one may suppose that the retouch to rejuvenate the edge is later than the use. In fact the function as a barb requests a sharp cutting-edge.

One distal microburin (fig. 36/5) has characteristc impact traces. The use of this microburin as a point is reinforced by the presence of a proximal retouch forming a kind of tang that might facilitate its hafting. Such a tang has not been observed on the other distal and proximal microburins that do not show any trace of wear.

From the above observations, it is possible to conclude that the manufacture of the trapezoidal arrowheads was not the only activity practised at the site, as indicated by the presence of microburins; but that the armatures for hunting purposes were brought back to the camp, as testified by damaged geometrics with impact traces.

3.6.3 Other activities

Traces of cutting meat (or fat, or muscles), connected with butchering have been observed on one complete (figs. 36/6; 39/c) and one broken blade (figs. 36/7; 39/d). Along the working edge of the blade, some macrotraces produced by contact with tendons, cartilages and bones have been noticed. On the contrary, the blade fragment, which does not show any macrotraces along its working edge, is only characterized by micro-traces caused by cutting meat, that is by material that does not produce any mechanical friction.

The left edge of one red flint blade (figs. 36/10; 40/a and b) has been utilised for grooving wood. The macro-traces are rather well developed indicating an extended use of the tool. The corresponding micro-traces are much less visible because their development has removed most of the micro-surface of the working edge where polishes and striations were formerly present. At its distal end (ventral face), the blade shows other micro-traces produced by contact with wood as well as macro-traces both in the same area and near the proximal end (ventral face).

The well-defined distribution of the macro-traces which cannot be attributed to utilisation or to post-depositional or casual agents, as well as their complementarity with the micro-traces caused by contact with wood, seem to indicate that the tool had been hafted in wood. The points of the blade with better developed micro-traces might be those where the handle had been pressured more heavily during its use. The location of the macro-traces seems to indicate that most of the blade had been hafted and that only the working edge, characterized by macro and micro-traces was exposed.

One complete blade (fig. 36/8) and one distal fragment show traces attributable to the cutting of medium-hard material.

The presence of one fabricator with diagnostic traces at both ends (fig. 37/14) confirms that the tools were manufactured at the site. A similar instrument comes from the contemporary site of Sopra Fienile Rossino on the Cariadeghe upland (Lemorini, 1989).

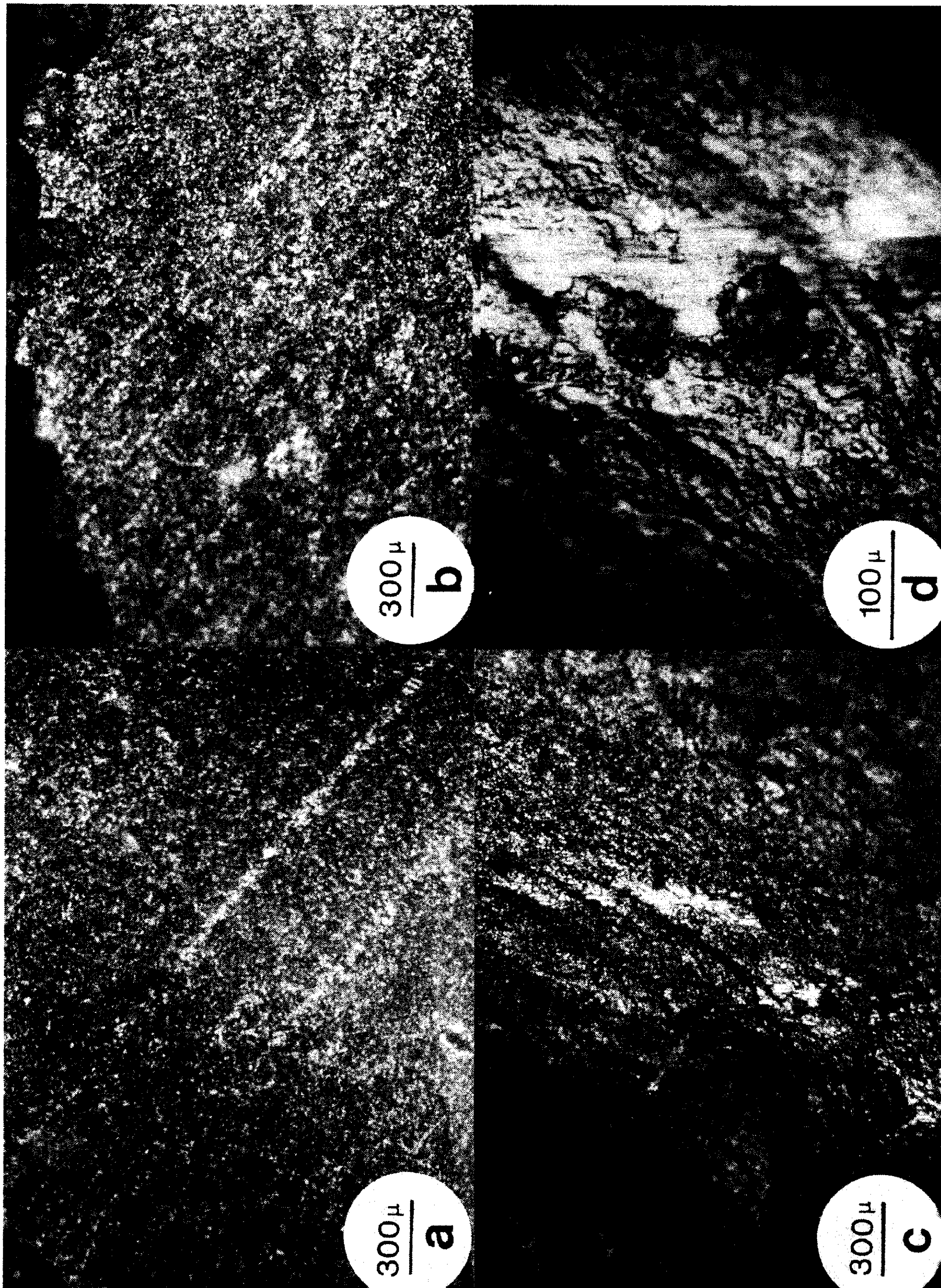


Fig. 39 – Laghetti del Crestoso: micro-photographs of retouched bladelet 112 (line of polish; manufacture: 100x) (a); (line of polish+striations; impact: 200x) (b); bladelet 145 (line of polish along the edge; cut meat; 100x) (c); blade from square A99 (line of polish along the edge; cut meat; 100x) (d) (*photos by C. Lemorini*).

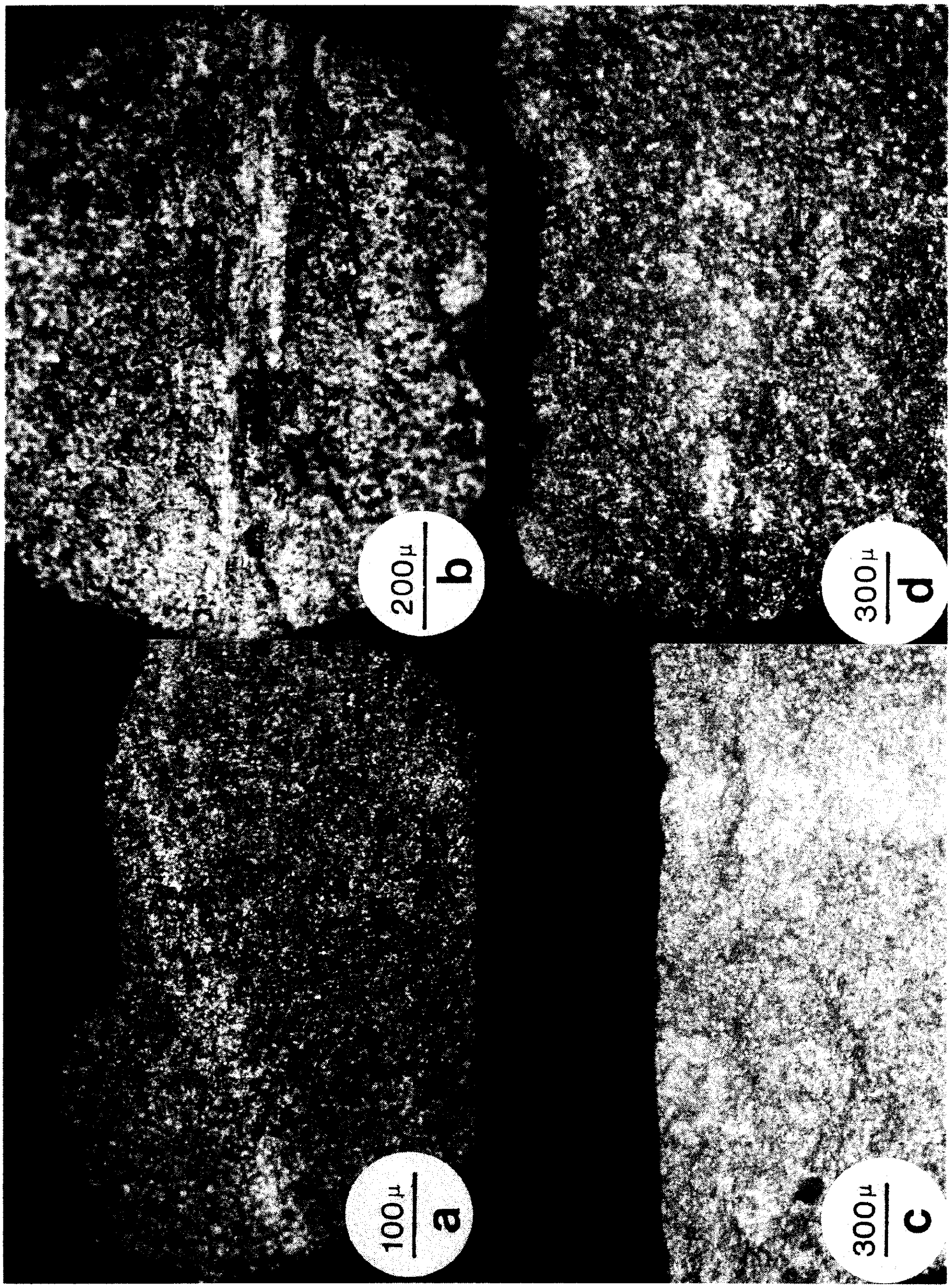


Fig. 40 – Laghetti del Crestoso: micro-photographs of bladelet 168 (line of polish along the edge; groove wood: 100x) (a); particular of photograph a (groove wood: 400x) (b); retouched bladelet 159 (particular of a band of polish along the edge; manufacture or hafting; antler: 200x) (c); trapeze 119 (line of polish along the edge; hafting: 100x) (d) (*photos by C. Lemorini*).

3.6.4 Considerations

The traceological data allow some considerations on the function of the site of Laghetti del Crestoso.

The presence of armatures (points and barbs) with impact traces undoubtedly indicated that they were carried back to the site with the hunted prey. At least some butchering occurred inside the camp as indicated by instruments with traces from cutting meat.

These considerations have a more precise functional significance if framed in the picture of the whole flint assemblage. The percentage of debris and the high number of bladelets and trapezes clearly confirm the local manufacture of such tools and, more widely, the strong specialization of this high-altitude site. From a traceological point of view this specialization can be summarized in the production of various types of projectile armatures (geometrics as points and bladelets as points and barbs) that after being used were brought back to the site and repaired. Such activity might be indicated not only by the presence of the instruments with impact traces, but also by the blades utilized for working wood or medium-hard materials, probably connected with the repairing of the hafts.

This activity is to be added to butchering during the short period when the site was occupied for hunting purposes.

3.7 Considerations on the flint assemblage (P.B.)

From a typological point of view, the Laghetti del Crestoso assemblage constitutes a very specialized flint industry characterized by typical artefacts. Among these are subconical bladelet cores with prepared platform, trapezoidal geometrics obtained with the microburin technique, long scrapers with simple, marginal retouch and one bladelet with two opposed notches. The number and percentage of the various tools is given in fig. 15, from which it is clear that the geometrics are the most numerous instruments represented at the site (47.5%).

The analysis of the spatial distribution of the artefacts together with the re-conjoining of the flint products would indicate that the site was briefly settled two different times. This view is also supported by the results of the ^{14}C dates which show a lapse of time between the two periods of occupation (fig. 41).

According to the results of the above-mentioned analyses, the assemblage attributable to the first occupation is characterised by isosceles trapezes with completely retouched truncations, hypermicrolithic scalene triangles, smaller microburins and smaller-sized cores. The more recent phase is typified by the occurrence of numerous scalene trapezes with *piquant trièdre* point, larger-sized microburins and subconical, bladelet cores.

Given these premises it has to be emphasised that the assemblage is difficult to compare with those of other Castelnovian sites for the following reasons: a) Laghetti del Crestoso is the only Castelnovian high-altitude camp of the alpine arc so far excavated over a reasonable surface; b) it is the only encampment to have produced several features which indicate that a number of fortunate coincidences have favoured the preservation of the site to the present; c) two moments of ephemeral occupation belonging to the beginning of the Atlantic climatic period seem to be represented at the site. They both are to be attributed to the Castelnovian Culture, whose internal chrono-typological sequence is very lacunose due to the absence of complete series at all the stratigraphical sequences so far excavated (BIAGI, 1997b).

The only other high-altitude Castelnovian sites so far excavated are those of Fontana de la Teia on Mt. Baldo (1200m) (BAGOLINI and NISI, 1976), Plan de Frea II in Val Gardena (1930m)

(ALESSIO *et al.*, 1994), Pian dei Cavalli, at the Splügen Pass (2100m), Passo della Comunella (1619m) (CREMASCHI and CASTELLETTI, 1975), Lama Lite (1764m) (CASTELLETTI *et al.*, 1976) and Corni Piccoli (1398m) (BIAGI *et al.*, 1981); the first three are in the Alps, the others are scattered along the Tusco-Emilia Apennine watershed.

The assemblage of Fontana della Teia is still unpublished, even though, according to the excavator (BAGOLINI, pers. comm. 1977), the site gave no man-made structures such as fireplaces or pits.

Plan de Frea II yielded an extremely poor industry collected from layer 3, including one end scraper and one triangle. This is «*clearly not enough to give a cultural attribution to the site*» (ALESSIO *et al.*, 1994: 150) dated to 7000±200 BP (R-1497) and to 7112±121 BP (R-2567). From the high-altitude encampment of Pian dei Cavalli, FEDELE *et al.* (1992) describe a poor assemblage, among which one typical Castelnovian trapeze, dated to 7950±240 BP and 7540±210 BP.

Passo della Comunella was excavated in 1974. The Late Mesolithic industry, characterized by bladelet cores, carenoid end scrapers, trapezes obtained with the microburin technique, truncations and retouched blades, was scattered over an area of at least 300 square metres. A charcoal sample of *Fraxinus* collected from the horizon containing the industry, gave a date of 6960±130 BP (Birm-830).

Three small trenches were opened in 1976 in different areas of the site of Lama Lite, in the Reggio Emilia Apennines. It yielded a lithic industry characterized by a very high percentage of trapezes. These represented 51.4% of the total assemblage and were produced locally as indicated by the very high number of microburins. The other tools are represented by denticulates (among which are notched blades), truncations and long scrapers, while other instruments are almost absent. The length/width diagram of the complete unretouched artefacts gave results comparable to those obtained from Laghetti del Crestoso. The site has been dated to 6620±80 BP (R-1394) (CASTELLETTI *et al.*, 1994: 202). Also the site of Corni Piccoli, some 4 kms north of Lama Lite, yielded a poor assemblage characterized by trapezes and notched blades (BIAGI *et al.*, 1981).

Apart from the above-mentioned high-altitude sites, the parallels can be extended to the Castelnovian pre-Alpine camp of sopra Fienile Rossino in the Cariàdeghe Upland (Brescia). A ^{14}C date attributes it to the same period of the later occupation of the Laghetti del Crestoso (Bln-3277: 6810±70BP: ACCORSI *et al.*, 1987: 251). The site yielded a rich assemblage composed of a great variety of instruments. These include typical Castelnovian tools comprising subconical bladelet cores, trapezoidal geometrics obtained with the microburin technique and notched bladelets as well as burins, end scrapers, straight perforators, hypermicrolithic tools – mainly scalene triangles – and one «fabricator» (ALESSIO *et al.*, 1987: 258, fig. 15/7; LEMORINI, 1990: fig. 1/6) almost identical to that of fig. 25/G. The analysis of the macro-botanical remains should indicate that Fienile Rossino (925m) was settled between the beginning of the Autumn and the following Spring.

The percentage of the primary flint tool types of the most important Castelnovian sites is given in the following table 5. It shows that both the assemblages of Laghetti del Crestoso and of the high-altitude site of Lama Lite in the Tusco-Emilia Apennines have striking similarities which characterize the high level of specialization of the lithic industry.

Among the other sites of great importance for the periodization of the Castelnovian Culture are the rock-shelters of Romagnano III, Pradestel and Vatte di Zambana of the Adige

Valley in the neighbourhoods of Trento (BROGLIO, 1971; ALESSIO *et al.*, 1983) and the cave sites of the Trieste Karst (CANNARELLA, 1984; CREMONESI *et al.*, 1984), mainly those of Benussi (ANDREOLOTTI and GERDOL, 1973); Azzurra (CICCONE, 1993) and Edera (BIAGI, 1996: 12).

In table 5 below, are listed some of the above-mentioned Castelnovian sites, which gave a reliable number of «primary types». As is apparent this table shows close similarities between the whole assemblage recovered from the Laghetti del Crestoso and the Apennine high altitude camp-site of Lama Lite, mainly for the high incidence of trapezoidal arrowheads, truncations and long scrapers.

Table 5

Site name*	L.L.	Com.	Rom.	S.F.R.	Ben.	Crestoso
(layer)			(AB2-1)		(3)	
n. of tools	138	517	189	98	150	40
Altitude	1764m	1619m	220m	925m	250m	2006m
^{14}C date**	6620±80	6960±130	7500±160	6810±70	7050±60	6790±120
Tool types			Percentage (%)			
B	–	5.7	1.6	6.1	2.0	–
G	1.4	13.5	18.5	10.2	34.7	2.5
T	9.4	13.7	5.8	10.2	6.0	17.5
Bc	0.7	1.7	1.6	7.2	2.7	–
PD	1.4	4.2	2.8	7.2	2.0	–
LD	–	5.1	–	4.1	0.7	2.5
DT	0.7	5.7	3.2	2.0	3.3	–
Gm	51.4	13.5	32.2	20.4	12.0	52.5
(Triangles)	(–)	(–)	(0.5)	(6.1)	(1.3)	(5.0)
(Trapezes)	(51.4)	(13.5)	(31.7)	(14.3)	(10.7)	(47.5)
P	–	–	1.6	–	–	2.5
L	8.6	7.3	0.5	8.1	4.0	17.5
R	–	5.8	2.1	6.1	4.7	–
A	0.7	6.8	2.1	4.1	7.3	–
D	13.7	6.8	13.8	14.3	14.0	5.0

*L.L.=Lama Lite, Com.=Comunella Pass, Rom.=Romagnano III, S.F.R.=Sopra Fienile Rossino, Ben.=Cave Benussi.

**Only the more recent date from each site is shown.

Nevertheless the accurate analysis of the Laghetti del Crestoso flint assemblage has demonstrated that the short-term, high-altitude encampments might represent more articulated phases of occupation which cannot be detected during excavation due to depositional and post-depositional factors. Thus, according to the results obtained from this study, it is now difficult to argue *a priori* that the assemblages from the open-air high altitude sites always represent only one single period of occupation.

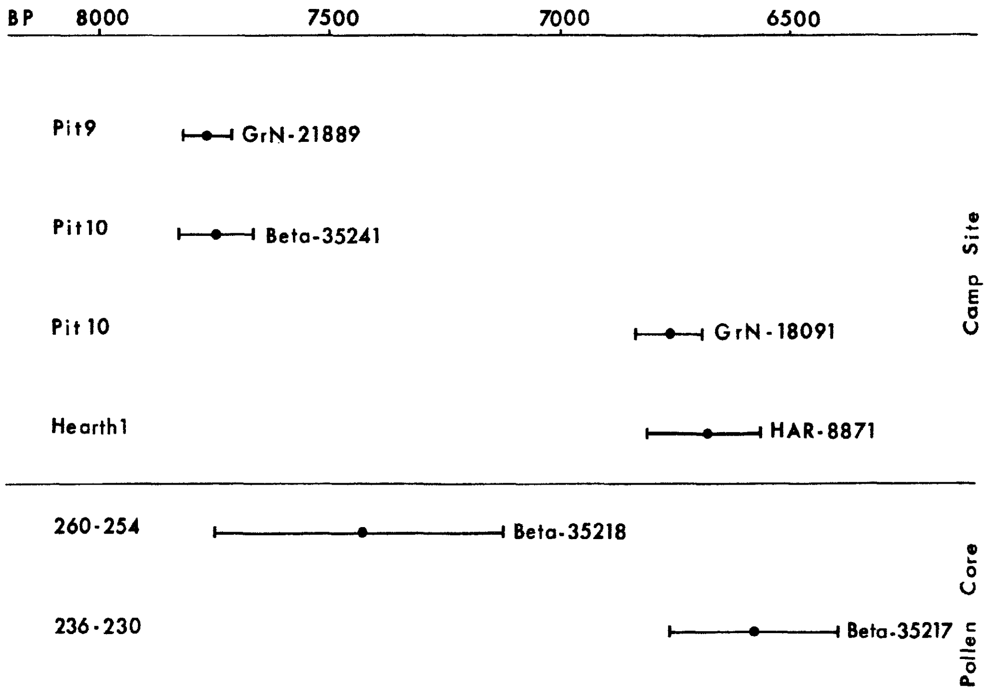


Fig. 41 – Laghetti del Crestoso: diagram of the ^{14}C dates from the Mesolithic site (top) and the pollen core (bottom) (*drawn by P. Biagi*).

4. THE CHARRED WOOD (R.N.)

4.1 The analyses (R.N.)

The charcoal fragments collected were very numerous and unevenly distributed across the site. Some 850 (i.e. more than 60%) of a total of 1275 fragments analyzed for the taxonomic identification come from archaeological features including pits and hearths. This fact resulted in the good preserving conditions because of the stability in these features.

The structures containing most of the charcoals are numbers 3, 9, 10 (figs. 12 and 13), 11 and 12 (figs. 6 and 7).

Altogether the following taxa have been identified: *Picea excelsa*, *Larix decidua*, *Pinus sylvestris/mugo*, *Juniperus* sp., *Laburnum* sp., *Sorbus* sp. and *Betula* sp.. For reasons based on the ecology of the site and not on the anatomy of the woods (which is not decisive in these cases), we refer the last three genera to the species *Laburnum alpinum*, *Sorbus aucuparia* or *S. chamaemespilus* and *Betula pendula*.

The data obtained from the analyses are shown in tables 6 and 7 below.

Table 6

Taxon	N. of fragments	%
Picea excelsa	805	63.2
Picea/Larix	189	14.8
Larix decidua	51	4.0
Pinus sylvestris/mugo	173	13.6
Juniperus sp.	7	0.6
Laburnum sp.	29	2.3
Sorbus sp.	19	1.4
Betula sp.	2	0.1

Table 7

Square metre (layer)	Taxon	N. Fragms.	Notes	Feature
AA100	*Picea excelsa*	24	11,12 gr rings	
AA1	*Picea excelsa*	8		
AA2 (2)	*Picea excelsa*	10		2
AA3 (2)	*Picea excelsa*	4		2
A1	*Picea excelsa*	6		
A2 top	*Picea excelsa*	2		
A2	*Picea excelsa*	5		
	Picea/Larix	8		
	Laburnum alpinum	3		
A3 (2)	*Picea excelsa*	3		
A3	*Picea excelsa*	39		11
	Picea/Larix	7		
	Larix decidua	12		
	Sorbus sp.	3		
A100 (2)	*Picea excelsa*	7		5
BB1	*Picea excelsa*	5	27 gr rings	
BB2	*Picea excelsa*	5		
	Larix decidua	2		
BB3 (2)	*Picea excelsa*	27		
	Larix decidua	5		
B100 (2)	*Picea excelsa*	7		
B1	*Picea excelsa*	1		
B2	*Picea excelsa*	32		
	Picea/Larix	8		
	Larix decidua	9	22, 26 gr rings	
	Pinus sylvestris	9		

	Laburnum alpinum	4		
	Betula sp.	2		
B3 (2)	*Picea excelsa*	27	11,19 gr rings	
	Pinus sp.	16		
	Sorbus sp.	2		
	Laburnum sp.	12		
B3 (2)	*Picea excelsa*	25		3
	Larix decidua	8		
	Pinus sp.	6		
B4 (2)	*Picea excelsa*	6		
B4	*Picea excelsa*	28		9
B-C3 (2)	*Picea excelsa*	44		9
	Larix decidua	8		
	Pinus sp.	2		
C1	*Picea excelsa*	27		
C2	*Picea excelsa*	13		
	Sorbus sp.	1		
	Laburnum sp.	1		
C3 (2)	*Picea excelsa*	2		
C3 (2)	*Picea excelsa*	61		3
	Pinus sp.	25		
	Sorbus sp.	8		
C3 (2)	*Picea excelsa*	12		4
	Larix decidua	7		
C4 (2)	*Picea excelsa*	17		
C4	*Picea excelsa*	87		9
	Laburnum alpinum	12		
C4	*Picea excelsa*	34		10
	Pinus sp.	15		
C100 (2)	cf. *Sorbus*	5		
C100 top	*Picea/Larix*	3		
D1	*Picea excelsa*	41		1
	Picea/Larix	49		
	Pinus sp.	3		
	Juniperus sp.	5		
D2	*Picea excelsa*	3		
D2	*Picea excelsa*	17	22, 26 gr rings	1
D3 (2)	*Picea excelsa*	12	18 gr rings	
	Pinus sp.	6		
D4 (2)	*Picea excelsa*	28	12 gr rings, branches	

	Picea/Larix	13	
D4	*Picea/Larix*	29	10
	Pinus sylvestris/mugo	81	
	Pinus sp.	6	
	Juniperus sp.	2	
D4	*Picea excelsa*	7	12
D100	*Picea excelsa*	4	
E1	*Picea/Larix*	16	1
	Pinus cf. *sylvestris*	4	
E2	*Picea/Larix*	14	
E3	*Picea excelsa*	12	
	Picea/larix	10	
E3 (2)	*Picea excelsa*	2	
E3	*Picea excelsa*	80	12
	Picea/Larix	27	
E4 (2)	*Picea excelsa*	13	
	Picea/Larix	5	
E4	*Picea excelsa*	26	12

4.2 Considerations (R.N.)

Spruce (*Picea*) is not only the most common genus but is also represented in most samples. From these data one can suggest that its accessibility from the site was easier in comparison with all the other species, for the Castelnovian hunter-gatherers.

The rather small dimensions of the fragments did not allow any particular observation on the characteristics of the wood collected for burning. In a few cases, however, the number of the growth rings was more than 20, rising to a maximum of 27 on wood of *Picea*. Very few fragments come from branches and the majority of the pieces come from adult trees.

No wood degraded by fungal hyphae contamination in the vessels, resin canals and tracheids was observed. It must be emphasised, however, that the small dimensions of the fragments reduced the surface area of observations. The absence of fungi degradation might be related to a gathering of timber directly from still living branches.

On the basis of the analytical data, a proximity to a spruce woodland is suggested. Nevertheless, this would not exclude the presence of other conifers growing on well differentiated soils and topographical conditions in the surrounding areas. This might explain the discrepancy between these data and those obtained from the pollen analyses (see SCAIFE, Chapter 5), which shows the predominance of pine over larch and spruce. It should be considered also that cultural reasons, as well as the specific conditions of gathering, could be determinant factors in the choice of timber.

The distribution of the species in the archaeological features does not show any points of particular significance. It must, however, be pointed out that the structures with the largest quantity of charcoal (9, 10 and 12) are pits containing stones or surrounded by them, possibly used as wind-break or for keeping heat. The latter usage is well documented both in the ethnographical and in the archaeological record (see, for instance, VALLA and LECHEVALLIER, 1989; VIKKULA, 1993).

A possible carbonized point made by *Larix/Picea* was found in Fireplace 1 (fig. 42) (BARONI *et al.*, 1990: 49).

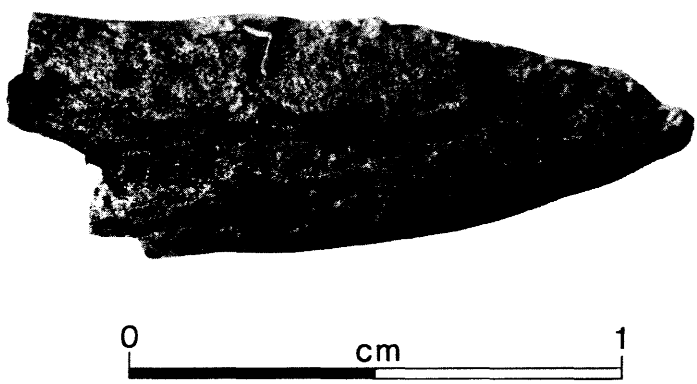


Fig. 42 – Laghetti del Crestoso: carbonized wooden point from Hearth 1 (*photo by R. Nisbet*).

5. POLLEN ANALYSIS OF THE LAGHETTI DEL CRESTOSO CORRIE BASIN (R.S.)

5.1 Introduction (R.S.)

The study presented here forms part of an archaeological and palaeoecological research project which is being undertaken in the region bounded by the watersheds of the Val Camonica-Val Trompia-Val Sabbia valleys. Since the development of «modern» pollen analysis by VON POST (1916), a substantial number of investigations have been carried out in the lower Alpine montane zone and lowland plain of north-eastern Italy (KELLER, 1931; DALLA FIOR, 1932; 1933; 1969). BERTOLDI (1968) has reviewed researches carried out in the Garda region and has provided valuable data on pollen identification. Work carried out by ZOLLER (1958; 1960) in Switzerland and the detailed studies of SCHNEIDER (1978; 1985), SCHNEIDER and TOBOLSKI (1975) and HOROWITZ (1975) especially, illustrate that major vegetation and environmental changes have taken place during the Holocene period in the southern Alpine zone of Italy, Switzerland and Austria.

Changes in vegetation have been traditionally viewed as a response to changing climate, pedogenesis, the rates of plant dispersal from glacial refugia during the Holocene and the altitudinal changes in vegetation communities through time. Human activity may have played a significant, if not the most important, role in the shaping of the vegetation and environment of many areas of Italy and indeed of Europe as a whole. The composite of these factors is crucial to an understanding of the past and present vegetation development of the Alpine zone and of the environment in which early human populations lived and influenced their surroundings. This study which is being undertaken in conjunction with Brescia Museum of Natural Sciences, seeks to investigate the changing vegetation and environment of the high Alpine zone of the Val

Camonica-Val Trompia-Val Sabbia region and at altitudes not yet studied in detail in terms of their vegetation history (note however, HOROWITZ, 1975; WICK, 1994). This study has been further influenced by the discovery (by Biagi) of a substantial number of high altitude Mesolithic (BIAGI *et al.*, 1994b; BIAGI, 1995) sites which date to the Preboreal, Boreal (Sauveterrian) and Atlantic (Castelnovian) periods (periods after MANGERUD *et al.*, 1974). These sites have been found in close proximity to water sources largely in cirque lakes at Rondeneto and Laghetti del Crestoso. Preliminary pollen data have been published on these sites (BARONI *et al.*, 1987; SCAIFE, 1991; BIAGI *et al.*, 1994a; SCAIFE and BIAGI, 1994). Archaeological and palaeoecological investigations suggest that these archaeological sites represent the ephemeral encampments of essentially hunting and perhaps foraging communities. This is in accord with the generally held view of Mesolithic subsistence. It has been suggested that such encampments were possibly of seasonal character (BIAGI *et al.*, 1994a) and that in addition their lacustrine situation, they were also ecotonal between montane forest and the montane pasture. The palynological studies, being undertaken in conjunction with the archaeological excavations, seek to establish a regional radiocarbon dated vegetational chronology; to provide an insight into the local environment of the Mesolithic populace and to determine the extent and impact, of anthropogenic activity in this region. This paper concentrates on the pollen analysis and radiocarbon dating of peats in the Laghetti del Crestoso corrie basin.

5.2 Laghetti del Crestoso (R.S.)

a) *Stratigraphy*

A total depth of 3.14 metres of peat and sediments was located in the corrie basin. The crude stratigraphy was identified as follows:

10-16cm:	Modern roots of Cyperaceae and Juncaceae. Unconsolidated. Not sampled.
16-149cm:	Predominantly brown monocotyledonous root and detritus peat with layers of *Hypnum* moss peat at 30-32cm and 102-116cm.
149-280cm:	Organic mud-*gyttja*. Buff-grey coloured with some fine macro root inclusions.
at 216cm:	Organic *gyttja* mud but with sand inclusions.
at 230cm:	Charcoal specks noted in grey organic muds.
at 256cm:	Charcoal specks noted in grey organic muds.
280-314cm:	Inorganic sediments. Banded grey and pink mottled and laminated silts and clay. No visible organic content.
314cm:	Bedrock.

b) *Pollen methodology*

Samples for pollen analysis were obtained using a «short nosed» Russian peat corer. The area selected for coring was chosen for its proximity to the Mesolithic (Castelnovian) archaeological site. This site also represents the deepest sediment sequence located. Cores obtained were sampled later and prepared in the Laboratory of the Quaternary Environmental Change Research Centre, Department of Geography of the University of Southampton. Standard pollen extraction techniques were used (MOORE *et al.*, 1991) and included sodium hydroxide deflocculation, digestion of silica with hydrofluoric acid and Erdtman's acetolysis for removal of cellulose. The concentrated pollen was mounted in glycerol jelly (in preference to silicone oil), identified and counted at magnifications of x400 and x1000 using Zeiss and Olympus biological research microscopes with phase contrast facility. Recourse was made to various reference collections for identification of critical taxa.

Samples were analysed at an interval of 8cm for most of the sequence but at closer intervals between 280cm-258cm. A total sum of 400 grains excluding wetland taxa was counted at each level. The pollen sum adopted was as a percentage of total dryland pollen, that is, trees, shrubs, dwarf shrubs and most herbs. Wetland taxa have been calculated as a percentage of the pollen sum plus wetland totals. Spores are as a percentage of the pollen sum plus spores. Freshwater algal cysts of *Pediastrum* were similarly calculated as a percentage of the pollen sum plus *Pediastrum*. The results of these calculations are presented in standard pollen diagram form (fig. 43a-d) using Tilia and Tilia Graph in the Department of Geography, University of Southampton. Pollen assemblage zones have been designated on the basis of the inherent variations in the pollen biostratigraphy and, at a later date, will be compared with analyses of other sites examined in the region.

c) *Radiocarbon dating*

Radiocarbon dating of the peat core has been undertaken in conjunction with dating of the adjacent Mesolithic site (see Chapter 2.3). The following dates have been obtained from zones of lithological or biostratigraphical significance.

88-84cm	2120±60 BP	GrN-18092	peat
106-102cm	3060±110 BP	Beta-35215	peat
138-134cm	2770±100 BP	Beta-35216	peat
218-215cm	4810±250 BP	GrN-18093	organic mud
236-230cm	6680±180 BP	Beta-35217	organic mud
260-254cm	7540±310 BP	Beta-35218	organic mud
267-265cm	7630±300 BP	GrN-18094	organic mud
280-274cm	9590±190 BP	Beta-35219	organic mud

These data have been plotted on a time/depth curve (fig. 44) and with the exception of a Beta-3215 and Beta-3216 which are inverted, a valid relationship is found for those levels above 265cm. The date of 9590±190 BP (Beta-35219) is substantially earlier and with pollen data discussed below is indicative of a hiatus in sediment deposition.

d)*The pollen biostratigraphy*

Six pollen assemblage zones have been recognised and their principal characteristics are described from the base at 316cm upwards. This extends those divisions (4 zones) previously recognised (Scaife, 1991) and arises because of additional pollen levels analysed subsequently.

Zone LC:1 (314cm-280cm) *Pinus*-Gramineae-*Artemisia*. Red and blue laminated sediments.

This basal pollen zone is characterised by the highest *Pinus* values recorded at this site. Percentages decline from their highest values of 80-90% at the base of the profile. Sporadic occurrences of other arboreal taxa include *Betula*, *Larix*, *Ulmus*, *Alnus* and *Corylus* type. Herbs are dominated by Gramineae (to 20%) and *Artemisia* (11%). Other herbs include *Thalictrum*, Caryophyllaceae, Chenopodiaceae, *Saxifraga*, *Rumex*, Scrophulariaceae, and Compositae taxa-*Bellis* type, *Aster* type and *Anthemis* type.

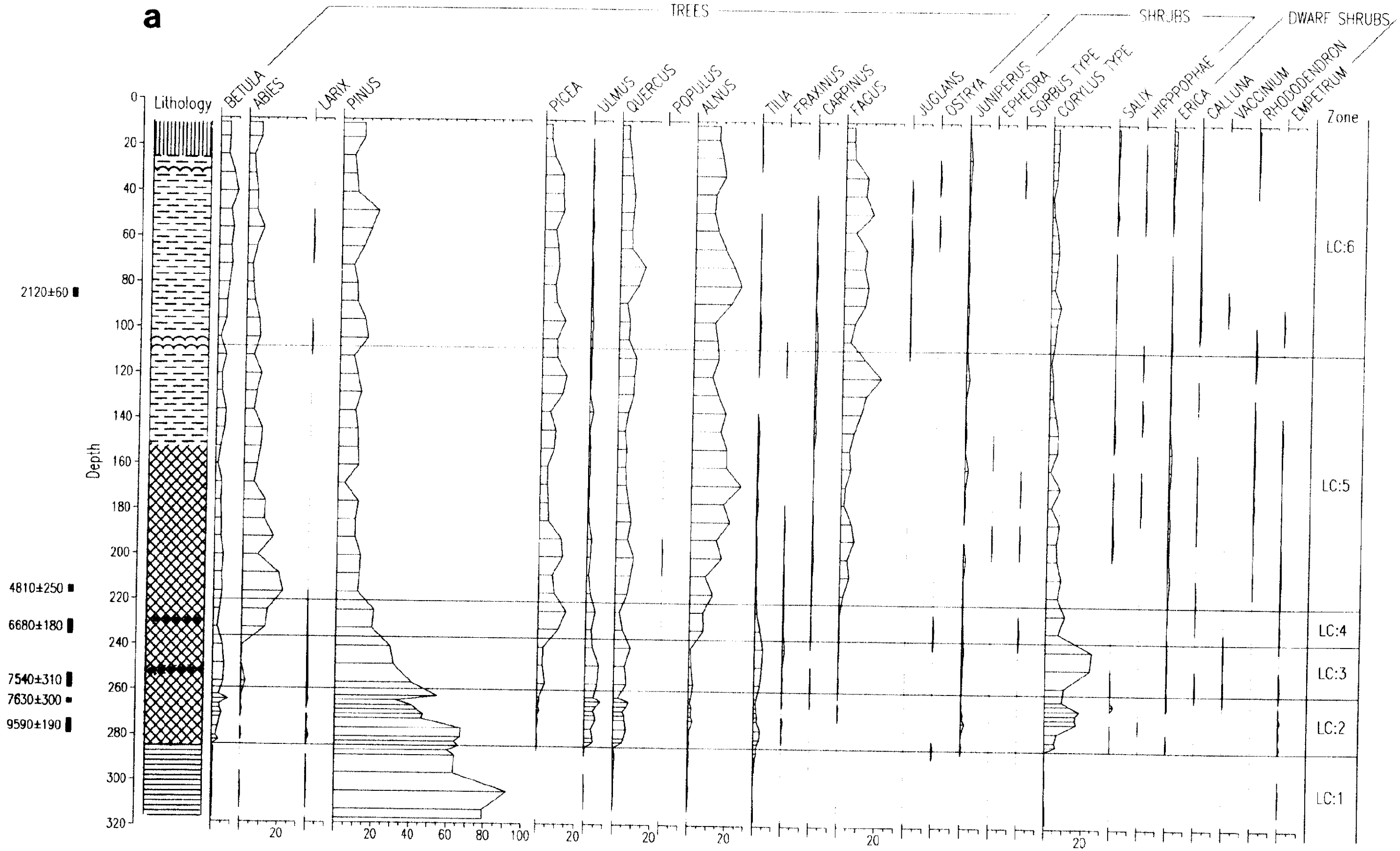
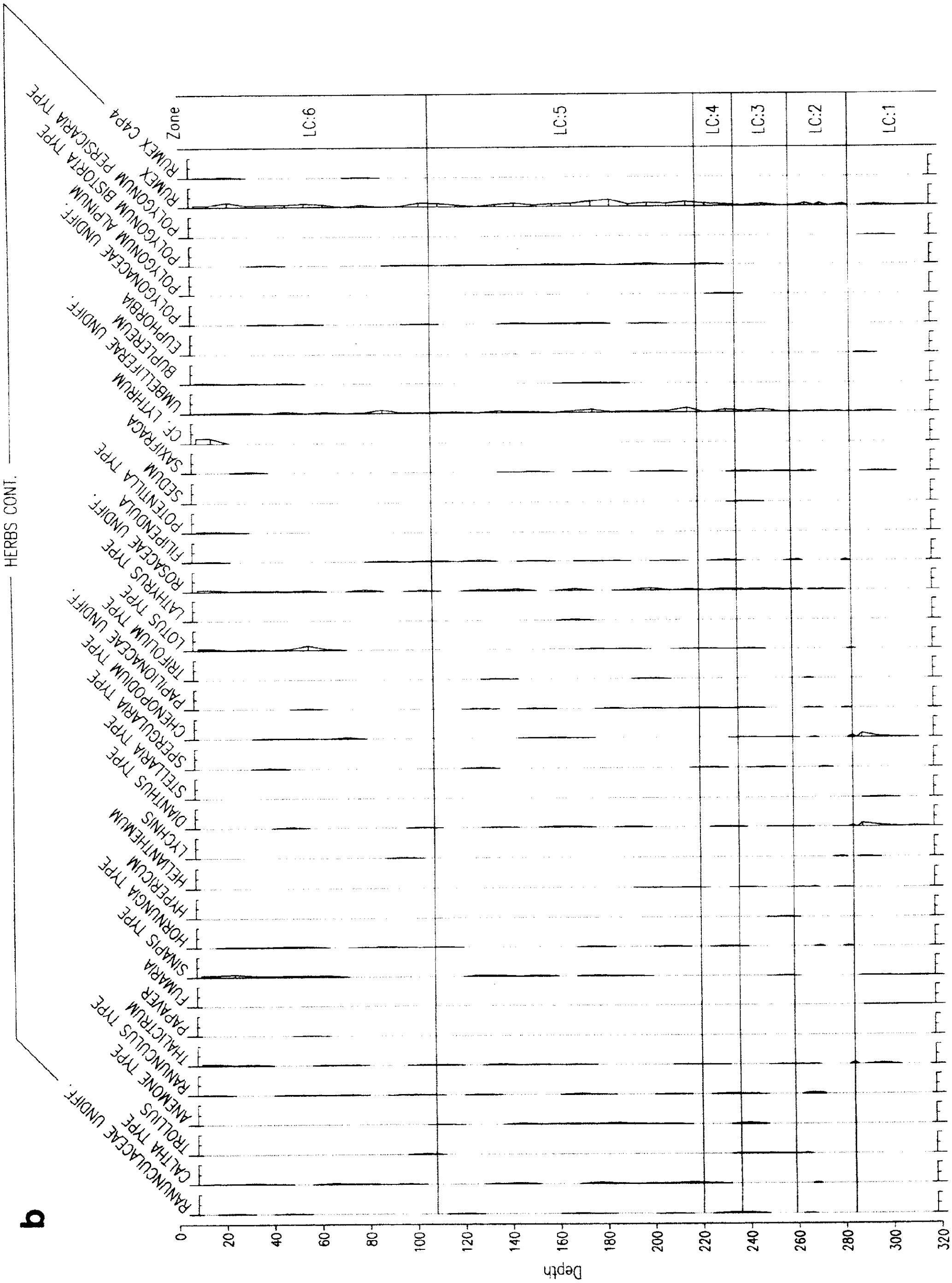
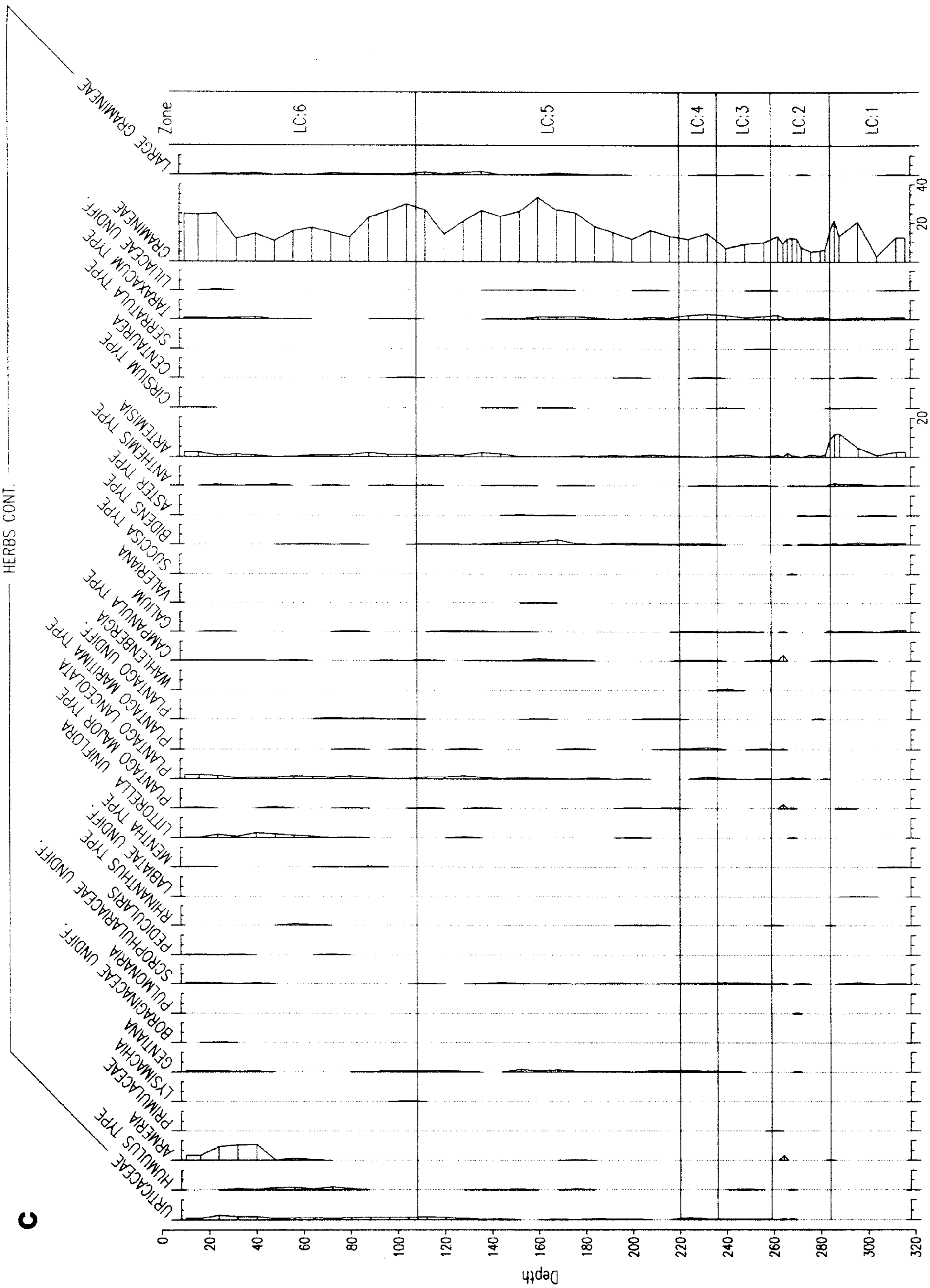
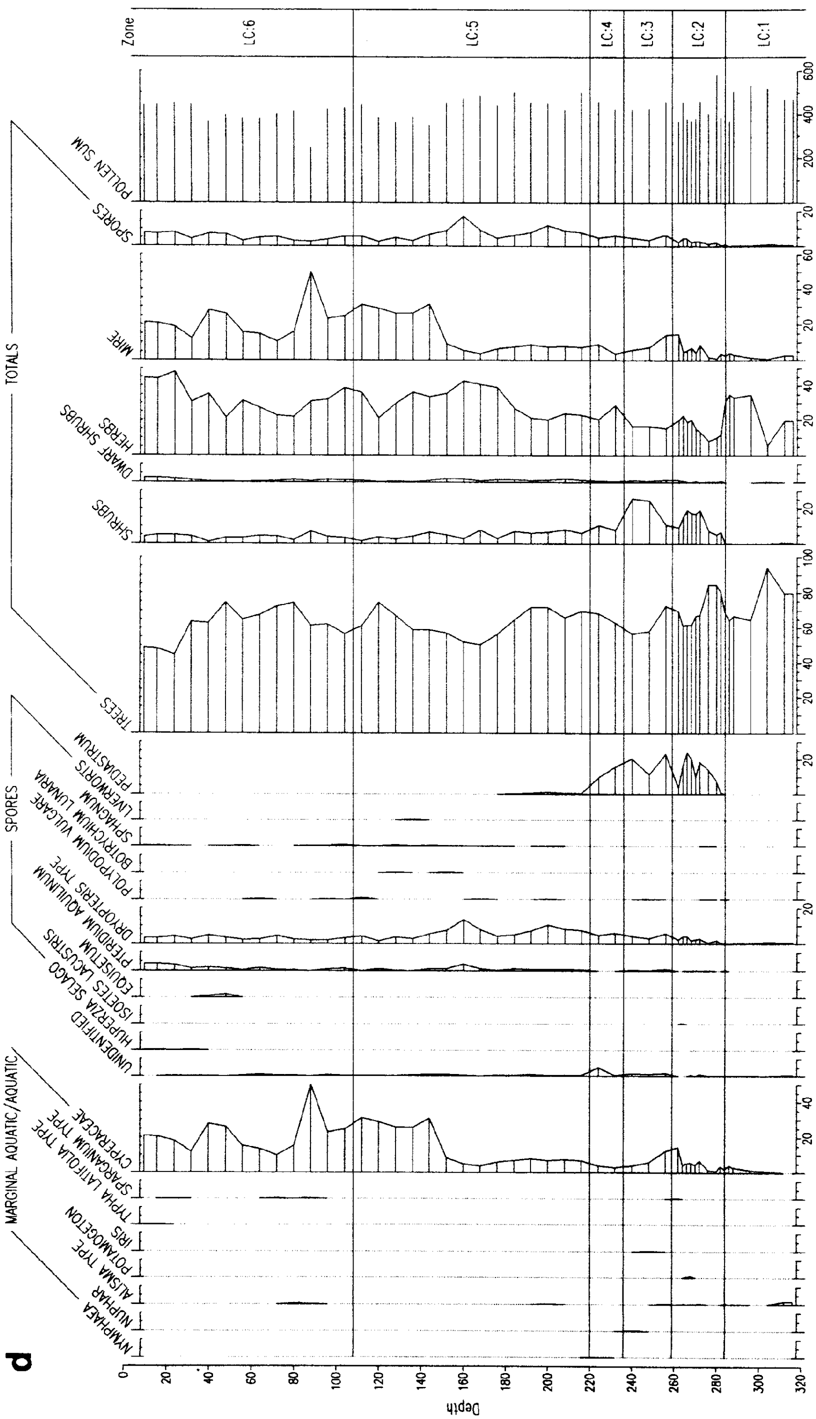


Fig. 43 (a, b, c and d) – Laghetti del Crestoso: pollen diagram constructed from analysis of peat and sediments in the lower laghetto (*drawn by R. Scaife*).


b
HERBS CONT.
Zone
LC:6
LC:5
LC:4
LC:3
LC:2
LC:1
RUMEX CAP4
RUMEX
POLYGONUM PERSICARIA TYPE
POLYGONUM BISTORTA TYPE
POLYGONUM ALPINUM
POLYGONACEAE UNDIFF.
EUPHORBIA
BUPLEURUM
UMBELLIFERAE UNDIFF.
CF. LYTHRUM
SAXIFRAGA
SEDUM
POTENTILLA TYPE
FILIPENDULA
ROSACEAE UNDIFF.
LATHYRUS TYPE
LOTUS TYPE
TRIFOLIUM TYPE
PAPILIONACEAE UNDIFF.
CHENOPODIUM TYPE
SPERGULARIA TYPE
STELLARIA TYPE
DIANTHUS TYPE
LYCHNIS
HELIANTHEMUM
HYPERICUM
HORNUNGIA TYPE
SINAPIS TYPE
FUMARIA
PAPAVER
THALICTRUM
RANUNCULUS TYPE
ANEMONE TYPE
TROLLIUS
CALTHA TYPE
RANUNCULACEAE UNDIFF.
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
Depth


C
HERBS CONT.
LARGE GRAMINEAE
GRAMINEAE
LILIACEAE UNDIFF.
TARAXACUM TYPE
SERRATULA TYPE
CENTAUREA
CIRSIUM TYPE
ARTEMISIA
ANTHEMIS TYPE
ASTER TYPE
BIDENS TYPE
SUCCISA
VALERIANA
GALIUM
CAMPANULA TYPE
WAHLENBERGIA
PLANTAGO UNDIFF.
PLANTAGO MARITIMA
PLANTAGO LANCEOLATA
PLANTAGO MAJOR TYPE
PLANTAGO UNIFLORA
LITTORELLA
LABIATAE UNDIFF.
MENTHA TYPE
RHINANTHUS TYPE
PEDICULARIS
SCROPHULARIACEAE UNDIFF.
PULMONARIA
BORAGINACEAE UNDIFF.
GENTIANA
LYSIMACHIA
PRIMULACEAE
ARMERIA
HUMULUS TYPE
URTICACEAE
Zone
LC:6
LC:5
LC:4
LC:3
LC:2
LC:1
20
40
Depth
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320


d
TOTALS
POLLEN SUM
SPORES
MIRE
HERBS
DWARF SHRUBS
SHRUBS
TREES
SPORES
PEDIASTRUM
LIVERWORTS
SPHAGNUM
BOTRYCHIUM LUNARIA
POLYPODIUM VULGARE
DRYOPTERIS TYPE
PTERIDIUM AQUILINUM
EQUISETUM
ISOETES LACUSTRIS
HUPERZIA SELAGO
UNIDENTIFIED
MARGINAL AQUATIC/AQUATIC
CYPERACEAE
SPARGANIUM TYPE
TYPHA LATIFOLIA TYPE
IRIS
POTAMOGETON
ALISMA TYPE
NUPHAR
NYMPHAEA
Zone
LC:6
LC:5
LC:4
LC:3
LC:2
LC:1
Depth

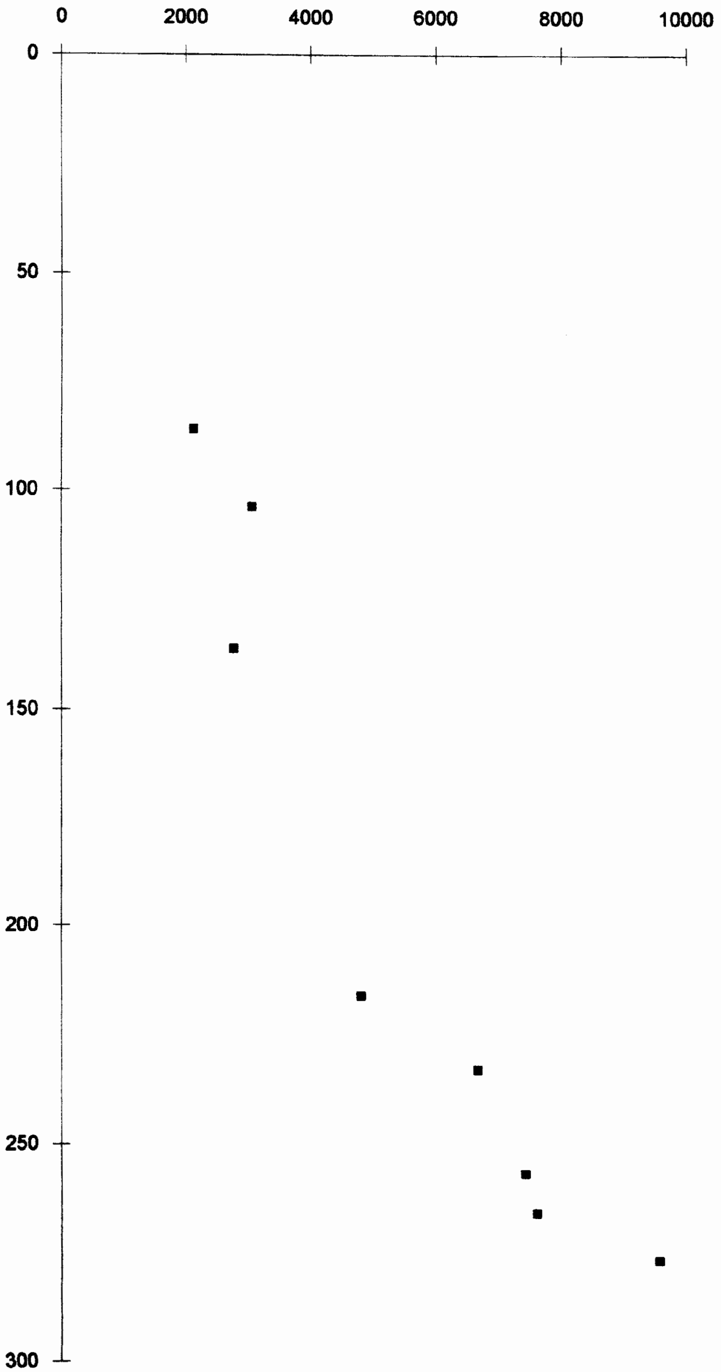


Fig. 44 – Laghetti del Crestoso: time-depth curve of the ^{14}C dates from the pollen profile of the corrie basin (*drawn by R. Scaife*).

Zone LC:2 (280cm-258cm) *Betula-Pinus-Ulmus-Quercus-Tilia-Corylus* type-*Pediastrum*. There is a marked stratigraphic change from the inorganic sediments of zone LC:1 to organic muds (*gyttja*).

This zone is characterised by a marked increase in deciduous arboreal taxa from the preceding zone. *Pinus* (85%) remains dominant but declining in value. *Betula* (to 8%), *Ulmus* (8%), *Quercus* (9%), *Tilia* (4%) and *Corylus* (24%) are becoming important. Sporadic records of *Abies*, *Larix*, *Picea*, *Fagus* and *Fraxinus* are noted. In the cases of *Abies*, *Picea* and *Fagus* these are the first indications of these taxa prior to subsequent expansion. *Juniperus* is present with low values from the beginning of this zone. The overall importance of herbaceous pollen is reduced compared with LC:1, although the taxonomic diversity is greater. Gramineae (12%) and Cyperaceae (7%) have highest values. Records of Rosaceae, *Helianthemum*, *Rumex*, Urticaceae, and *Plantago lanceolata* are more continuous. Freshwater algal cysts of *Pediastrum* are important with increasing values into subsequent zones (LC:3 and LC:4) where it remains important and associated with the freshwater muds. Aquatic taxa are, however, poorly represented in this and subsequent zones with only sporadic occurrences of *Nuphar*, *Nymphaea*, *Potamogeton*, *Isoetes lacustris* and marginal aquatics such as, *Littorella*, *Alisma* type, *Typha latifolia* and *Sparganium* type. Spores of ferns (monolete/*Dryopteris* type) are present from this zone.

Zone LC:3 (258cm-236cm) *Betula-Pinus-Picea-Ulmus-Quercus-Tilia*. Stratigraphical continuity of organic detrital muds.

This zone is marked by the start of *Picea* expansion. *Tilia* and *Corylus* type have their highest percentage values (5% and 25% respectively). *Pinus*, however, remains dominant but with sharply decreasing values from 40% to 20%. *Quercus* (8%), *Ulmus* (9%), *Betula* (6%), *Larix*, *Fraxinus* and *Alnus* are also recorded. Herbs remain dominated by Gramineae and Cyperaceae along with the diverse assemblages noted for LC:2. *Pediastrum* remains important.

Zone LC:4 (236cm-220cm) *Abies-Pinus-Picea*. Organic muds showing a transition into monocotyledonous peats at the top of this zone.

Abies (to 13%) and *Picea* (to 15%) and *Alnus* (to 8%) values increase from the base of this zone. Other deciduous taxa noted in the preceding zone LC:2 and LC:3 remain although *Tilia* and *Corylus* type have reduced percentages (to 1% and 10% respectively). Herbs (28%) remain, in general, unchanged with Gramineae most important. *Pediastrum* declines sharply in this zone.

Zone LC:5 (220cm-108cm) *Quercus-Alnus-Fagus*. Organic lacustrine muds change to Gramineae/Cyperaceae peat with some indications of *Sphagnum* growth.

This substantial zone is delimited by the expansion of *Alnus* and *Fagus* (to 25% and 22% respectively) and sporadic records of *Carpinus*. Conversely, *Pinus*, *Larix*, *Ulmus*, *Fraxinus* and *Tilia* have diminished values. *Pinus* (10%), *Abies* (10-15%), *Picea* (10%), *Quercus* (to 10%) and *Corylus* type (5%) remain as important constituents of the pollen spectra. Herbs are dominated by Gramineae (32%) and Cyperaceae (30%) which become increasingly important. The increase in the latter represents autochthonous growth and has been designated as pollen assemblage sub-zone LC:5a. Other herbs show a marked taxonomic diversity typical of Alpine habitats. Notable in this respect are *Thalictrum*, *Rumex*, *Gentiana*, *Saxifraga* and Plantaginaceae for example. Dwarf shrubs/Ericaceae communities are also noted and comprise *Erica*, *Calluna*, *Vaccinium*, *Rhododendron* and *Empetrum*.

Zone LC:6 (108cm-20cm) Monocot. peat of the preceding zone continues to the present surface where vegetation is dominated by Gramineae, Cyperaceae and *Juncus* spp.

This pollen zone has been delimited on the occurrence of *Juglans* from the a depth of 108cm. Although only rare occurrences their presence may be an important stratigraphical and dating (Roman phase) marker by virtue of its long distance dispersal from the lowland zone. *Ostrya* is similarly noted from 56cm. Arboreal taxa otherwise remain unchanged except for some increase in *Betula*. *Abies*, *Picea*, *Pinus*, *Quercus*, *Alnus* and *Corylus* are recorded at values noted for zone LC:5. This is pertinent since the site of Crestoso is today above the modern tree line and as such, arboreal pollen with the exception of *Alnus* (*A. viridis*) and sporadic *Larix*, is largely derived from lower altitudes. The question of the tree line is discussed further (see below). Some expansion of open short turf taxa is indicated by *Armeria* (pollen assemblage sub-zone LC:6-b from 40-15cm), *Gentiana* and some expansion of *Juniperus* (*J. communis* ssp. *alpina*).

5.3 Discussion of vegetation changes and chronology (R.S.)

a) The Late Würmian and Early Holocene

Radiocarbon dating of pollen assemblage zone LC:1 was not possible because of the absence of organic material. However, a date of 9590±190 BP has been obtained from the lowest part of the overlying organic muds of pollen assemblage zone LC:2. Thus, pollen zone LC:1 pre-dates this and the lowest 36cm of sediments started to accumulate during the late-glacial period consequent on local deglaciation of the Val Camonica watershed. The laminated character of the sediments and the pollen flora are also commensurate with this period with *Pinus* and herbs dominated by Gramineae and *Artemisia*. The position of the upper tree line at this time is unclear since, although *Pinus* is dominant, no stomata have been found in this zone. It is likely that at this altitude, during this late-glacial phase, the vegetation comprised open herb-rich grassland, disturbed ground alpine and steppe type communities. Such communities are similarly recorded for the site of Tonale (1885m) in Val Camonica (Horowitz, 1975) with pollen of *Juniperus* and *Artemisia* indicating steppe vegetation. In Valcamonica, the dominance of *Pinus* is viewed by Horowitz as an early Holocene successor to the steppe vegetation during the pre-Boreal from 10,000-9500 BP. Schneider (1985), however, points to its dominance as early as 13,000 BP for the south-eastern Alps. The importance of *Pinus* and the sporadic records of other tree and shrub taxa appear to represent longer distance transportation from lower altitudes. Updrafting of pollen from lower altitudes is perhaps the most difficult aspect of the interpretation of high altitude pollen spectra with complex processes of atmospheric mixing and altitudinal transport (Solomon and Silkworth, 1986). Such transport from lower altitudes is a pronounced phenomenon of the Laghetti del Crestoso site where strong diurnal anabatic winds occur.

At 280 cm, the change to organic accumulation (*gyttja*) occurred in the Crestoso corrie lake basin. A radiocarbon date of 9590±190 BP (GrN-18091) has been obtained from the base of the organic mud and thus, the transition from sediment to organic mud/*gyttja* occurred at the start of the Holocene period (*ca.* 10,000 BP). Dating of *gyttja* deposits may, however, be affected by other factors such as mixing and mineral carbon error. Cysts of the freshwater algae *Pediastrum* and aquatic plant taxa *Nuphar*, *Nymphaea*, *Potamogeton* and *Isoetes lacustris*, illustrate that a stable freshwater lake existed in the corrie until *ca.* 5000 BP. With the start of this lacustrine phase, there is also a stronger representation of thermophilous deciduous trees including *Betula*, *Quercus*, *Ulmus*, *Fraxinus*, *Tilia* and *Corylus* although *Pinus* continues to be important but with progressively declining values. The presence of such a diverse range of thermophiles and the radiocarbon dates of 7630±300 BP (GrN-18094) and 7540±310 BP (Beta-35218) at 267-265 and 260-254cm respectively may indicate that there is a temporal hiatus in the early part of this zone which has resulted in an absence of pre-Boreal and early Boreal sediments. There was, however, no indication in the stratigraphy of any phase of drying out. The early Holocene amelioration of climate associated with plant migration factors initiated the demise of pine woodland at lower altitudes in favour of those deciduous taxa noted above. The climatic aridity of the early Holocene of the Alps and Appenines is now becoming generally accepted (COHMAP MEMBERS, 1988; PONEL and LOWE, 1992; CRUISE, 1990a; SCAIFE in BIAGI *et al.*, 1994a). Correspondingly, the altitudinal growth limits of deciduous taxa may also have been higher and it is likely that during this period, the upper tree line may have reached the altitude of Laghetti del Crestoso (*ca.* 2000m) whereas at present it lies some 300 metres lower. During the period of pollen assemblage zone LC:2 and LC:3 it is thought that the site was in the upper tree zone, dominated by open *Larix* woodland with a diverse herb component in the ground layer. As noted above, pollen of *Pinus* may have been transported from lower altitudes where woodland existed. From the presence of *Tilia* and *Fraxinus* pollen, it is suggested that these taxa were of substantial importance at lower altitudes. The importance of *Tilia* continues into assemblage zone LC:3 where it attains its highest values in the period from 7540±310 BP (Beta-35218). This expansion is associated with the continued decline of pine woodland and is likely to be a function of increased competition from deciduous woodland under conditions of favourable soils and climate during the late Boreal and Atlantic periods. *Pinus* was perhaps being replaced by *Picea* which, although evidenced in small percentages from the beginning of the Holocene, becomes important from the base of this zone reflecting its migration from the south-east (KRAL, 1972 in TALLANTIRE, 1973). MARKGRAF (1970) has similarly pointed to the early expansion of *Picea* in the eastern Alps from the period of temperature amelioration and in Switzerland at a later date through the indirect agencies of prehistoric human activity. TALLANTIRE (1973) has contended this later anthropogenic causation in favour of climatic considerations. Here, a purely climatic and plant migrational causation is viewed as the most likely cause of the increasing importance of *Picea.* Once established, it remains important throughout the pollen profile reflecting its Holocene dominance of the middle altitude alpine forests of this region.

b) The Middle Holocene

Abies follows a similar (although later than *Picea*) pattern of expansion becoming important in zone LC:4 and attaining maximum values at the base of LC:5. This expansion is mirrored by *Alnus* (possibly *A. viridis*) and a decline in *Tilia* values. This phenomenon has similarly been seen in the south central and south-eastern alps (SCHNEIDER, 1985) and possibly represents the start of the Mid-Holocene, Atlantic period (MANGERUD *et al.*, 1974) when climatic conditions were possibly as warm as the preceding pre-Boreal and Boreal periods but with higher humidity from increasing maritime influences. This phase of woodland development is undoubtedly complex, reflecting plant competition and migrational factors associated with changing climatic parameters. With further pollen analyses and radiocarbon dating of sites at different altitudes and aspects, the altitudinal vegetation belts and pollen-stratigraphic chronology may be established for the Holocene of this region. At Crestoso during the late-Boreal and Atlantic, the basin was in the upper tree line with open *Larix* woodland and with possible *Alnus* *viridis* growing at the upper margins. A *Juniperus* and Ericaceae lower shrub layer may also have been present. *Abies* and *Picea* with some *Pinus* was growing at a lower altitude; perhaps 50-100 metres lower. Deciduous woodland (*Quercus*, *Ulmus*, *Tilia* and *Corylus*) grew at lower altitudes. This pollen zone (LC:4) is of special relevance since at 230-232cm microscopic charcoal particles were recorded in the core sediments. Radiocarbon dating of this horizon at 6680±180 BP (Beta-35217) corresponds with the Mesolithic site (discussed below) located on the edge of the corrie basin dated at 6870±70 BP (GrN-18091) and 6790±120 BP (HAR-8871) (fig. 41).

c) The evidence for human activity and environment

The excavation of the Crestoso Castelnovian occupation site produced charcoal of *Pinus sylvestris/mugo* and *Picea/Larix* from one of the pits (structure 10) and *Laburnum* and *Betula* from the hearths (see Chapter 4). These have provided evidence of local woodland which was gathered for fire-wood although it cannot be assumed that wood was not carried from lower altitudes. This, however, seems rather unlikely and it is inferred that the encampment was within the upper tree line. Charcoal from Hearth 1 has produced a radiocarbon date of 6790±120 BP (HAR-8871); that from Pit 9 a date of 7870±50 BP (GrN-21889) and that from Pit 10 two dates of 6870±70 BP (GrN-18091) and 7850±80 BP (Beta-35241) placing the occupation(s) in the early part of the Mid-Holocene. Microscopic charcoal particles, although noted sporadically throughout the sediment and peat profile, were especially evident at 230cm and at 255cm in pollen assemblage zones LC:4 and LC:3. Radiocarbon dating has confirmed that the upper charcoal horizon, dated to 6680±180 BP (Beta-35217), relates to the local Castelnovian occupation; while the older one (Beta-35218: 7540±310 BP) should indicate a previous human occupation along the lake-shores by the beginning of the Atlantic period.

FEDELE (1992) has similarly noted the correspondence between charcoal and Mesolithic activity at the site of Pian dei Cavalli (2100m) which has been radiocarbon dated at 7950±240 and 7540±210 BP (FEDELE *et al.*, 1992).

Because of the ephemeral and seasonal character of the Mesolithic settlement, it is unlikely that the community had any major or long term impact on the vegetation and certainly no significant long term changes from this cause are evidenced in the pollen record. Pollen data do, however, provide evidence for the environment in which this activity occurred. As noted above, pollen zone LC:4 represents a period when the corrie lake basin appears to have been within the upper tree line. The small pollen representation of *Larix* in this pollen zone is, nevertheless, significant in view of its poor pollen production and dispersal characteristics and although no stomata were found, charcoal identified by Nisbet (Chapter 4) shows that *Larix* was growing locally forming open woodland at the upper tree line. *Alnus viridis* may also have been important as the uppermost deciduous element although its importance at lower altitudes from the late Boreal/early Atlantic cannot be precluded. Archaeological evidence of occupation at high altitudes and in such an ecotonal position has increased as a result of field survey carried out by BIAGI (1993) and it can be concluded that such habitats were favoured by these essentially hunting (and foraging at lower altitudes) peoples. SIMMONS' (1969; 1975) model of Mesolithic activity and environmental impact based on research in upland areas of England is analogous with this Alpine activity. The model discussed the human interaction with the upper limit of tree growth, favourable locations for water supply for both human and animal populations and as a consequence, areas of both seasonal occupation and hunting pursuits. This activity caused localised soil degradation, hillwash (evidence of silica in-wash into the peat) and local changes in vegetation to scrub. It is likely that here, the Castelnovian groups were similarly making use of water holes in the ecotonal upper tree belt which, apart from providing locally favourable sites for encampments, also provided open aspect woodland in which game was more readily hunted.

d) The sub-Boreal

Pollen zone LC:5 starts at *ca.* 5000 BP with the expansion of *Fagus* woodland. This appeared to be at the expense of *Tilia* and possibly to some extent of *Abies*, *Picea* and *Corylus*. The phenomenon of the *Fagus* rise has been widely recognised in the north west Mediterranean and especially the northern Appenines (LOWE, 1992; CRUISE, 1990b) and the Alpine zone (SCHNEIDER and TOBOLSKI, 1985; SCAIFE and BIAGI, 1994) and variously dated to the middle Holocene, and particularly the sub-Boreal (*ca.* 5000-2500 BP) period. This is in accord with the findings at L. Crestoso where *Fagus* expands from *ca.* 5000 BP along with *Carpinus* and *Alnus*. SCHNEIDER and TOBOLSKI (1985), have discussed the expansion of *Fagus* in detail, highlighting the problems of aspect and altitude in the interpretation of Alpine vegetation succession. With regard to *Fagus* they show that «*the earliest expansion took place on slopes with north-eastern exposure at lower sites*» (SCHNEIDER and TOBOLSKI, 1985: 254). This has been widely regarded as a climatic phenomenon (BERTOLDI, 1980) but elsewhere has been attributed to anthropogenic pressure (eg. as suggested by DE BEAULIEU *et al.*, 1982) in the Massif Central, France.

It is clear that this expansion was concomitant with the expansion of *Alnus* (possibly *A. viridis*) similarly noted by other researchers (SCHNEIDER, 1985). Whilst its growth at the upper tree line is not questioned, the possibility of its extension aided by prehistoric human activity (WELTEN, 1982) remains enigmatic. It must, however, be considered that during this period other *Alnus* species may also have expanded in lower altitudinal zones and on the lowlands. As noted above, the strong anabatic winds present at this site may have updrafted *Alnus* pollen from lower altitudes where increased humidity in the Middle Holocene promoted its expansion.

From pollen zone LC:5, the expansion of *Fagus* which was probably growing in association with *Abies* and possibly *Picea* (based on analogy with modern woodland community structure) is also associated with increased numbers of herbs and possible indications of prehistoric agriculture. This marks the beginning of Neolithic cereal and pastoral agricultural subsistence at lower altitudes from a date of *ca.* 6000 BP when modifications to the composition of the mixed *Fagus* and *Abies* woodland have been widely recognised (BERTOLDI, 1980; DE BEAULIEU *et al.*, 1982; CRUISE, 1990b). Identification of pastoralism in the pollen record is difficult and obscured because of the prevalence of «natural» species rich grasslands in glades, open woodland at the upper ecotonal belt and above the tree line (SCAIFE, 1991). Only with overgrazing and evidence of herb taxa which are promoted through the effects of differential grazing or through nutrient enrichment might it be possible to isolate evidence for high altitude pastoralism. Thus we might expect expansion of anthropochorous taxa such as *Cirsium*, *Chenopodium*, *Rumex*, *Polygonum alpinum* as well as expansions in those taxa normally associated with pastoralism such as Gramineae and *Plantago lanceolata*. Some workers have regarded reduction of *Abies* and increase of *Fagus* as anthropogenically significant (in the French Massif Central: DE BEAULIEU *et al.*, 1982; JALUT *et al.*, 1982; 1984, in the Pyrenees) through increased pressure for agricultural land at higher altitudes. This is difficult to reconcile at Crestoso where pollen values of *Abies* although declining in resonse to increased *Fagus* remain consistent throughout the period along with *Picea*. This possibly represents a local phenomenon and future analysis of nearby corrie basins such as Lago Ma, Lago Dasdana, and Vaiale will provide a clearer picture of changes in woodland structure at this time.

Cereal cultivation is more easily defined in pollen spectra. However, because many of the associated segetals are entomophilous, and thus have poorer pollen production and dispersion characteristics, smaller pollen frequencies of such crops and associated weeds are recorded. Although this is the case, the anabatic winds in montane zone can result in up-drafting of these arable types. At Crestoso, there is a consistent record of large Gramineae (>50±) pollen grains which may be attributed to cereal cropping at a lower altitude.

e) Roman and post-Roman changes

At 108cm (pollen zone LC:6), the occurrence of *Juglans* is diagnostic and provides a useful «marker» horizon for the period *ca.* 2000 BP when this taxon and *Castanea* were introduced into the region as cultivated crops (HOROWITZ, 1975; SCHNEIDER and TOBOLSKI, 1985). The introduction has been radiocarbon dated to 3060±110 BP (Beta-35215) at 106cm. However, the inverted date and consideration of the potential dating error on this «platform» of the ^{14}C calibration curve suggests that a Roman rather than Iron Age (*ca.* 1000 BC) date is in accord with the evidence. ZOLLER (1960) has similarly radiocarbon correlated the introduction and expansion of *Juglans* from Origlio and Losone-Arcegno. *Humulus/Cannabis* type (in this case separation to generic level was not possible with certainty) is similarly of note in this upper zone from 80cm and possibly represents cultivation of hemp (*Cannabis sativa*) from the Roman period.

From this period there occurs the final stages in the development of the vegetation which is evident today. Sub-Atlantic cooling and increased humidity from *ca.* 2500 BP (SCHNEIDER and TOBOLSKI, 1975) was accompanied by increased human pressure and further woodland clearances in the lowlands. This was perhaps in response to climatic deterioration and resultant cessation of cultivation at middle altitudes. Pastoralism undoubtedly remained important on upper montane grassland and pollen spectra indicate open herbaceous communities around the Crestoso basins (5).

6. CONCLUSIONS (C.B. and P.B.)

The high-altitude camp of Laghetti del Crestoso (LC1) was excavated in three campaigns carried out in 1987, 1988 and 1989, during which some 30-40% of the site was investigated. According to the stratigraphical evidence, the site was briefly settled in two distinct periods, the first corresponding to the fireplaces 1 and 5 and to the post-holes 6, 7 and 8 (figs. 7 and 11), and the second to the structures and fireplaces 3, 9, 10 (figs. 12 and 13), 1 and 12 (fig. 6). The distribution of the features and their stratigraphic relations indicate that the two settlement periods took place after a lapse of time during which the camp was not settled. The earlier phase of settlement is more recent than a podzolic soil recognized in Squares D and E (fig. 9); it was later eroded and colluviated downwards, towards the footpath, that is towards the lake-shore.

The ^{14}C dates related to these two phases are problematic. In fact, they are stratigraphically reversed and separated by a lapse of some 1000 years (fig. 8). The long hiatus can be compared with that of the two charcoal horizons identified in the pollen core at the depth of 230 and 255cm

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(5) Thanks are due to Dr. Renato Nisbet, Nick Branch and Wendy Scaife for their critical comments on this text and to Professor Paolo Biagi and Mr. Pierfranco Blesio, former Director of the Museo Civico di Scienze Naturali, Brescia, for academic and financial assistance.

respectively (fig. 41). Also these dates would suggest that the shores of the Laghetti del Crestoso were settled in two different periods: the first around the beginning of the Atlantic, the second around the end of the Early Atlantic (6).

These results are also supported by the evidence provided by the accurate study of the flint assemblage. In fact the distribution maps and the refitting analysis have demonstrated that the finds from the second settlement phase are perfectly *in situ*. The distribution map of the artefacts of the first phase, on the contrary shows a certain extent of redistribution all over the excavated surface. The two moments of occupation took place along the shores of Laghetti del Crestoso in Atlantic times (see Chapters 3.3.2 and 3.5), the later of which is to be attributed to a recent period in the development of the Castelnovian Culture. More precisely, part of the later site was undoubtedely connected with the manufacture of trapezoidal arrowheads, as indicated by the distribution map of the artefacts and the presence of all the production stages of such tools which occur in a well-defined restricted area of the encampment itself (fig. 34).

The reconjoining of the flint artefacts and the good state of preservation of the archaeological features show that, at least in the central squares of the investigated area, the soil erosion has been negligible, even though a concentration of slightly washed-down artefacts, mainly of microlithic dimensions, was recognized in squares AA-BB/3-4 (fig. 26).

After the last Castelnovian visit, the site remained almost exposed for some 5000 years, as indicated by the carbon date of the lowest lens of peat covering the site (HAR-8872: 1960±60 BP) (fig. 8).

As shown in fig. 45, the area surrounding the Laghetti del Crestoso is very rich in prehistoric and historic traces of occupation. They are indicated not only by the presence of

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(6) As reported in Chapter 2.3, three features of the Mesolithic camp of Laghetti del Crestoso have been ^{14}C dated. They are: Hearth 1 (6790±120 BP: HAR-8871), Pit 9 (7870±50 BP: GrN-21889) and Pit 10 (6870±70 BP: GrN-18091 and 7850±80 BP: Beta-35241) (fig. 41).
The two dates HAR-8871 and GrN-18091, suggest that the site was settled during the first centuries of the seventh millennium BP, that is in a recent phase in the development of the Castelnovian Culture. The other Castelnovian sites of northern Italy and of the Slovenian and Istrian Karst which have produced similar dates are listed in table 8 below.

Table 8

Site name	Date BP	Lab n.	Material	Site type
Pian dei Cavalli (SO)	7540±210	unpubl.	charcoal	high-altitude open site
Vatte di Zambana, layer 5 (TN)	7540±75	R-488	charcoal	valley-bottom rock-shelter
Romagnano III, layer AB2-1 (TN)	7500±160	R-1137A	charcoal	valley-bottom rock-shelter
Mondeval de Sora (BL)	7330±50	R-1939	charcoal	high-altitude rock-shelter
Piazzana (RE)	7330±85	R-397	charcoal	mid-altitude open site
Vatte di Zambana, layer 2.3 (TN)	7250±110	R-487	charcoal	valley-bottom rock-shelter
Plan de Frea II (BZ)	7112±121	R-2567	charcoal	high-altitude rock-shelter
	7000±200	R-1497	»	» »
Benussi (TS), layer 3	7050±60	R-1043	bones	cave
Covoloni Broion (VI)	6970±60	R-892	charcoal	cave
Passo Comunella (RE)	6960±130	Birm-830	charcoal	high-altitude open site
Pradestel (TN), layer D	6870±50	R-1148	charcoal	valley bottom rock-shelter
Fienile Rossino (BS)	6810±70	Bln-3277	charcoal	mid-altitude open site
Edera (TS), layer 3a	6700±130	GX-19569	charcoal	cave
Breg (SLO), layer 3A	6630±150	Z-1421	charcoal	open site
Lama Lite II (RE)	6620±80	R-1394	charcoal	high-altitude open site
Podosojna (HR), layer g	6460±90	Z-198	charcoal	cave
Stanga di Bassinale (BS)	6330±45	GrN-20886	charcoal	high-altitude open site

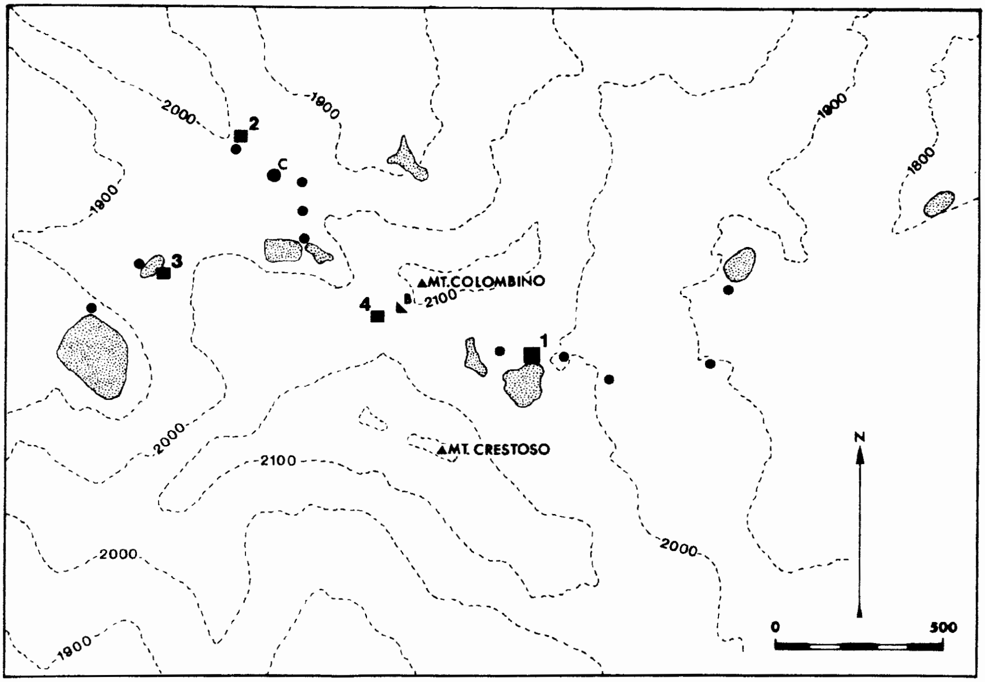

Fig. 45 – Location of the Mesolithic site of Laghetti del Crestoso in upper Val Trompia (1). The other symbols indicate the position of S. Glisente sites SGL1 (2), SGL2 (3), SGL3 (4) and of Late Mesolithic Castelnovian (C) and Chalcolithic/Early Bronze Age finds (B). The small dots are flint scatters probably to be attributed to the Mesolithic (*drawn by P. Biagi*).

material culture remains but are also proved by the ^{14}C dates obtained from a selected number of fireplaces discovered in the area (fig. 46)(7).

As regards the Late Mesolithic period, typical Castelnovian artefacts, namely trapezoidal arrowheads (microburins and other flint artefacts), mainly obtained from Mt. Alto flint (fig. 48) are recorded from one site in the St. Glisente saddle (fig. 45/C), while other less well defined Mesolithic, but most probably Castelnovian finds, come from the other sites.

As shown in the distribution map of fig. 1, most of the Mesolithic sites so far discovered along the Val Trompia-Val Camonica watershed are facing this latter valley. In fact, while no

(7) The prehistoric and historic fireplaces discovered in the area which have been ^{14}C dated are those listed in table 9, below:

Table 9

Site n°	Coordinates	Date BP	Lab n°	Material	Altitude m
SGL1	45°51'41" Lat N, 2°08'45" Long W	2895±35	GrN-18980	charcoal	1990
SGL2	45°51'30" Lat N, 2°09'10" Long W	1040±30	GrN-20888	charcoal	1990

Two more ^{14}C dates have been obtained from a profile described from a hand excavated trench some 500m to the NW of Mt. Crestoso (SGL3: 45°51'25" Lat N, 2°08'42" Long W) inside a cirque dammed by a Late Pleistocene moraine that revealed the following sequence (fig. 47):

0-5cm: A1 – sandy loam; very dark grey (10YR 3/1); poorly developed, fine granular, many roots; gentle wavy clear boundary to:

Mesolithic site has yet been discovered in Val Trompia, a few sites of this period have been excavated in the bottom of Val Camonica. A complex stratigraphy with occupation layers spanning a period from the Late Epigravettian to the Roman Imperial Age has been recently brought to light at Cividate Camuno. Here a Mesolithic layer attributed to the Boreal Sauveterrian Culture lies above a final Paleolithic occupation (POGGIANI KELLER, 1996: 195). Another site in the valley bottom which is to be attributed to the Late Mesolithic is that of the rock-shelter 2 of Foppe di Nadro (BIAGI, 1983), from the bottom layer of which comes a small assemblage of typical Castelnovian artefacts such as trapezes, notched blades and microburins. A much richer site of this period is that discovered along the innermost moraine of Provaglio d'Iseo (BIAGI, 1976), along the shores of the lake itself. From its surface hundreds of artefacts were collected which indicate that the site was strictly connected with the exploitation of the flint sources of the nearby Mt. Alto (PELLEGATTI, 1992-93).

Other sites are yet unknown in northern Valcamonica, even though a few (Boreal) Mesolithic camps are recorded in the neighbouring upper Valtellina, north of the Gavia Pass (BAGOLINI *et al.*, 1978; ANGELUCCI *et al.*, 1992).

The results obtained from the excavation and the study of the Laghetti del Crestoso Mesolithic site (LC1) demonstrate that the camp, which was settled in two distinct periods of the Early Atlantic climatic phase, was part of a complex system of occupations (BINFORD, 1982) by groups of Castelnovian Mesolithic hunter-foragers who inhabited the site for very brief periods, during the good season, for hunting purposes. The presence of Late Mesolithic sites in the middle Val Camonica valley bottom and along the southern shore of Lake Iseo, some one-day walk from Mt. Crestoso, indicates that LC1 was part of a site patterning, the base-camps of which are to be sought somewhere in the above-mentioned region. This observation is reinforced by the occurrence, at Laghetti del Crestoso (LC1), of a great abundance of characteristic Mt. Alto flints, nodules of which had been carried to the camp and locally flaked for the manufacture of the instruments which were necessary for hunting.

5-46cm: C1 – sandy silt and fine sand with lenses of coarse sand; dark reddish brown (5YR 3/4 – lithochromic); loose to friable, poorly developed medium granular; many charcoal pieces at the bottom; linear sharp boundary to:
46-47.5cm: Ab – silty loam; dark brown (7.5YR 3/2); weak coarse subangular, blocky; a sample from the top of the horizon gave a ^{14}C date of 1040±70 BP (Beta-35212); linear sharp boundary to:
47.5-50cm: C1 – gravelly coarse sand; dark reddish brown (5YR 3/4 – lithochromic); loose; gentle wavy sharp boundary to:
50-51cm: Ab – silty loam; dark brown (7.5YR 3/2); well developed, medium subangular blocky; linear sharp boundary to:
51-52cm: A/C – medium to coarse sand; dark reddish brown (5YR 3/2 – lithochromic); loose; gentle wavy sharp boundary to:
52-52.5cm: Ab – silty loam; dark brown (7.5YR 3/2); weak medium subangular; blocky; a sample from the bottom of the horizon was carbon dated to 1230±60 BP (Beta-35213); linear sharp boundary to:
52.5-65cm: C1 – gravelly coarse sand; dark reddish brown (5YR 3/4 – lithochromic); loose; wavy sharp boundary to:
65-80+cm: II – massive diamicton matrix supported (glacial ablation till); boundary not reached.
The study of this profile demonstrates that repeated phases of slope degradation and pedogenesis occurred in some two centuries, between the end of the VII and the beginning of the XI century AD. They are testified by colluvial deposits intercalated by poorly developed soils.
It is impressive to note that the two dates GrN-20888 and Beta-35212 are coincident. They testify that a more stable phase, which gave shape to a poorly developed soil, immediately pre-dates or is rather contemporary to some kind of human occupation. It occurred by the end of the X, beginning of the XI century AD, that is one of the periods suggested for the construction of the Shrine dedicated to St. Glisente (FAPPANI, 1983: 95) on the upper western slope of Mt. St. Glisente (SINA, 1944).

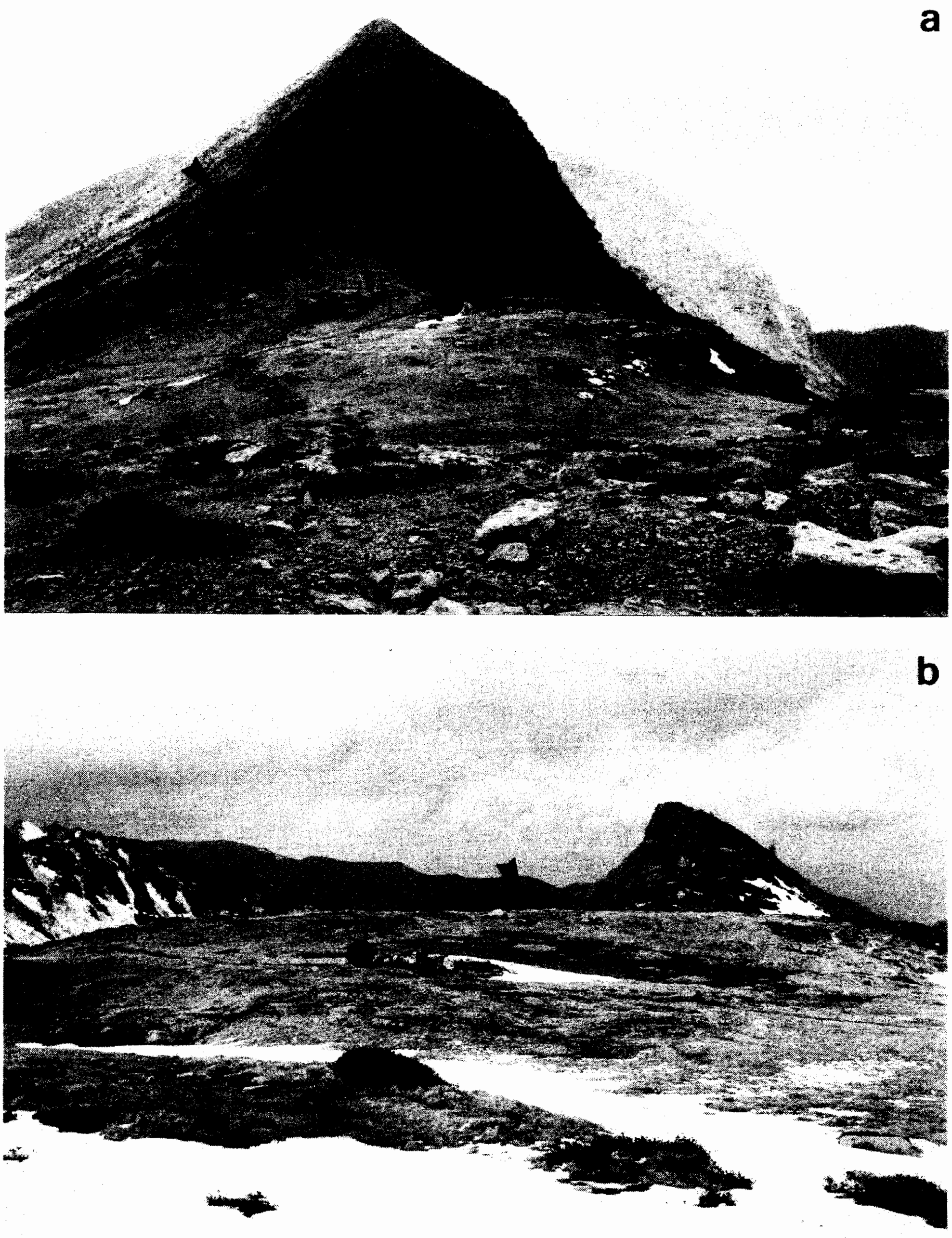

Fig. 46 – Location of hearth SGL1 (dot) and of the S. Glisente Niche (arrow) (a) and of hearth SGL2 (dot) close to a scatter of Mesolithic artefacts (arrow) (b) (*photos by P. Biagi*).

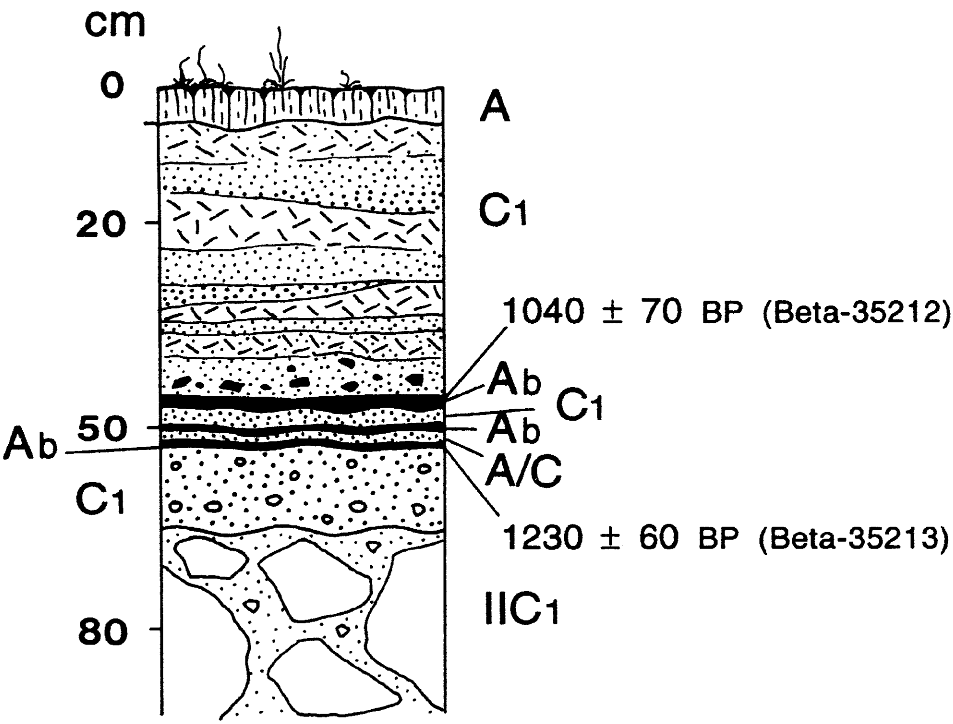

Fig. 47 – Profile of site SGL3 with the indication of the carbon dated soils (*drawn by C. Baroni*).

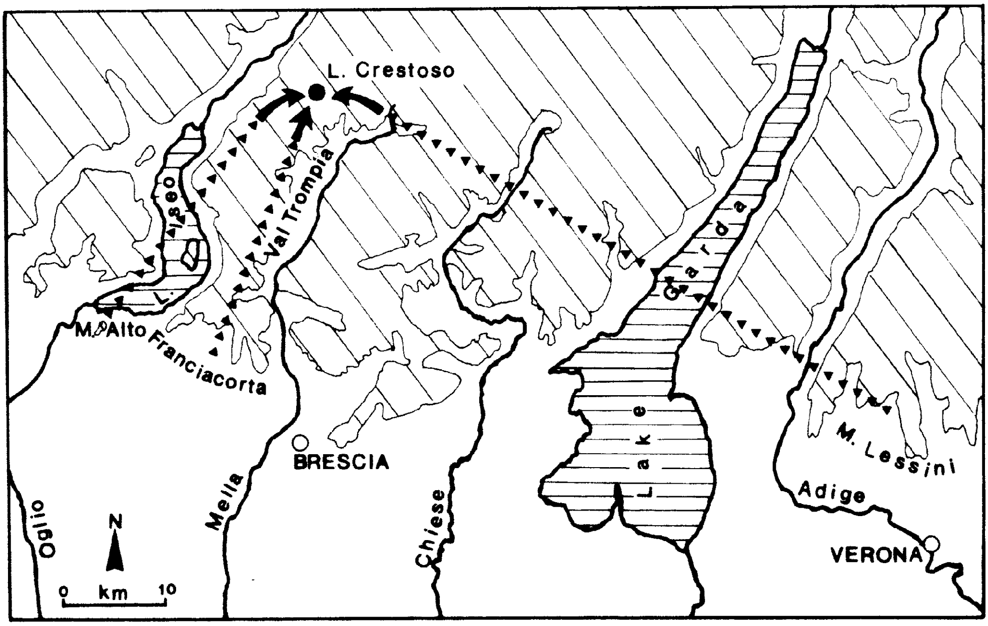

Fig. 48 – Flint outcrops exploited by the Laghetti del Crestoso Mesolithic community (*drawn by E. Starnini*).

Appendix 1 – MICROMORPHOLOGICAL CHARACTERIZATION OF THE STRATIGRAPHIC UNITS (according to BULLOCK *et al.*, 1985) (C.O.)

5-20 cm: O2

Microstructure: apedal
Porosity: 40% channels and chambers
C/F: porphyric
Mineral component: monocristalline quartz granules
Organic component: erbaceous plants tissues >30%; scarce fungal ife; sporadic *Abies alba* pollens; presence of algae colonies.
Pedogenetic features: absent
Observations: very low grade of humification; at the bottom a thin level contains rounded quartz granules.

20-27 cm: Ah

Microstructure: apedal
Porosity: 40%, chambers
C/F: porphyric
Mineral component: mono and polycrystalline quartz
B Fabric: speckled
Pedogenetic features: organic, birifrangent coatings aroud quartz granules
Observations: high grade of humidification

27-34 cm: E

Microstructure: apedal
Porosity: 20% channels and chambers
C/F: porphyric
Mineral components: mono and polycrystalline quartz
B Fabric: speckled
Pedogenetic features: rare organic cutans around quartz granules

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Carenoid Pre-core	I Class 1	35.0	62.0	31.0	c	30%	n	F12	296	E2	1 bottom	122,157,327,328,293,357,408	1989	24/A
Subconical core	I Class 1	36.0	46.0	25.0	c	25%	n	F11	332	D4	2		1989	17/1
Subconical core	I Class 2	40.0	26.0	24.0	c	10%	n	F4	192	A100	2 top	161,445	1988	20/B
Subconical core	I Class 2	45.0	55.0	34.0	f	50%	n	F10	-	-	surface	3 pieces	1986	20/A
Subconical core	I Class 7	28.0	26.0	16.5	c	20%	n	F3	46	A1	1 bottom	3,32,221	1987	20/C
End-scraper	G3	13.0	16.0	2.5	f	n	n	F4	-	-	surface		1991	17/2
Truncation	T2 rect conc [Apd]	18.0	11.0	3.0	c	n	n	F5	-	-	surface		1992	17/3
Truncation	T2 rect [Apd]/-Smd sen	16.0	5.5	2.0	c	n	n	F1	67	B2	2	170	1987	22/C
Truncation	T2 obl rect [Apd]	18.0	8.0	2.5	c	n	n	F4	146	B1	2		1987	17/4
Truncation	T2 obl conc [Apd prox]	18.5	9.0	2.0	f	n	n	F6	115	C2	2		1987	17/5
Truncation [Trapeze]	T2 obl conc [Apd pt]	11.0	11.0	2.0	f	n	n	F4	-	-	surface		1988	17/7
Truncation	T2 obl conc somm [Apd prox]	19.0	7.5	2.0	c	n	y	F7	250	AA1	2		1988	17/6
Truncation	T3 rect [Apd]	11.0	8.0	2.0	f	n	y	-	-	-	surface		1988	17/8
Triangle	Gm3 [T3 conc+PD2]	11.0	4.0	1.5	f	n	n	F3	-	AA100			1988	17/9
Triangle	Gm3 [T3 rect+PD2]/.Smd sen dist	14.0	4.0	1.5	c	n	n	F3	264	BB2	2		1988	17/10
Trapeze	Gm5 [T2 obl conc somm+T3 rect pt]	20.0	10.0	2.5	c	n	n	F7	-	-	surface		1986	17/11
Trapeze	Gm5 [T2 obl conc+T2 obl conc]	13.5	9.5	2.0	c	n	n	F6	40	C1	1 bottom		1987	17/24
Trapeze	Gm5 [T2 obl conc pt+T3 conc pt]	17.0	8.0	2.5	f	n	n	F7	62	C1	2		1987	17/21
Trapeze	Gm5 [T2 obl rect+T2 obl conc]	14.0	8.0	1.5	c	n	n	F3	114	C2	2		1987	17/26
Trapeze	Gm5 [T2 obl conc pt+T3 conc pt]	19.0	10.0	3.0	c	n	n	F16	119	C2	2		1987	17/22
Trapeze	Gm5 [T2 obl conc pt+T3 conc pt]	21.0	10.0	1.5	f	n	n	F16	152	E1	2C		1987	17/23
Trapeze	Gm5 [T2 obl conc+T3 conc pt]	18.0	11.5	2.0	c	n	n	F15	225	C100	2		1988	17/12
Trapeze	Gm6 [T3 rect+T3 rect]/-Smd dext	15.0	8.5	2.0	c	n	n	F4	28	C1	1 bottom		1987	17/25
Trapeze	Gm6 [T3 rect+T2 obl rect]	14.0	6.5	2.0	c	n	n	F3	123	C2	2		1987	17/27
Trapeze	Gm6 [T3 conc pt+T3 conc pt]	16.5	9.0	2.0	f	n	y	-	-	B2			1987	17/19
Trapeze	Gm6 [T3 rect+T2 obl rect]	16.0	10.0	1.5	c	n	n	F4	181	E2	2C		1987	17/28
Trapeze	Gm6 [T2 obl rect+T2 obl rect]	16.0	7.0	1.5	c	n	n	F3	298	E4	1 bottom		1989	17/29
Trapeze	Gm7 [T2 rect conc somm+T3 conc pt]	18.0	10.5	3.0	c	n	n	F7	-	-	surface		1989	17/14
Trapeze	Gm7 [T2 rect conc+T3 conc pt]	18.5	10.0	2.5	c	n	y	F7	-	B1			1987	17/15
Trapeze	Gm7 [T2 obl rect pt+T3 conc pt]	16.5	10.5	2.0	c	n	n	F7	-	B2			1987	17/16
Trapeze	Gm7 [T2 rect conc+T3 rect pt]	19.0	10.5	2.0	c	n	n	F7	21	C1	1 bottom		1987	17/13
Trapeze	Gm7 [T2 rect conc+T3 rect pt]	18.0	11.5	2.5	c	n	n	F7	109	C1	2		1987	17/17
Trapeze	Gm7 [T2 rect conc somm+T3 rect pt]	14.0	10.0	2.5	f	n	n	F7	217	A100	2		1988	17/18

Trapeze	Gm7 [T2 conc+T3 conc pt]	13.5	9.0	2.0	f	n	y	-	318	E4	1 bottom		1989	17/20
Backed blade	LD2 [Apd sen]	6.0	5.0	1.5	f	n	n	F3	-	A4	2		1989	17/30
Long scraper	L1 prox [Smd dext]	24.5	9.0	2.5	c	n	n	F1	10	A1	1 bottom	79,153,306,316,337	1987	22/B
Long scraper	L1 prox [Smd sen]	40.0	14.0	4.5	c	5%	n	F4	17	E2	1 bottom		1987	
Long scraper	L1 prox [Smd dext]	36.5	11.0	5.0	c	5%	n	F11	77	B2	2		1987	18/1
Long scraper	L1 [Smd dext]	38.0	12.0	2.0	c	n	n	F5	112	C1	2	202,213	1987	18/2
Long scraper	L1 [Smd sen]	16.5	10.5	1.5	f	n	n	F3	159	B1	2	219	1987	25/F
Long scraper	L1 [Sma part sen]	44.0	10.0	2.0	c	n	n	F15	168	B2	2 bottom		1987	18/3
Long scraper	L1 [Smd dext]	21.0	8.5	2.0	f	n	n	F4	254	B3	2 top		1988	18/4
Fabricator	P5 [SEpd bil]	13.0	12.5	18.0	f	n	n	F2	127	C1	2A	224	1987	25/G
Fabricator	P5 [SEpd bil]	45.0	17.0	21.0	c	n	n	F2	224	C100	2	127	1988	25/G
Notch	D1 prox [Apd dext]	10.0	5.0	2.0	f	n	n	F4	-	AA2			1988	18/5
Notched bladelet	D1 med [Smd bil]	30.0	13.0	2.5	f	n	n	F4	-	A1	1		1987	18/6
Microburin	Mb prox	7.5	7.0	1.0	c	n	n	F4	-	-	surface		1989	
Microburin	Mb prox	8.5	8.0	2.5	c	n	n	F7	-	C1			1987	
Microburin	Mb prox	15.5	8.0	2.0	c	n	n	F5	-	C1		112,202,213,B2,B3/2,C1,surface	1987	21/D
Microburin	Mb prox	10.0	9.5	2.5	c	n	n	F7	-	C1			1987	
Microburin	Mb prox	27.0	12.5	2.0	c	n	n	F7	-	D1			1987	18/8
Microburin	Mb prox	19.5	11.5	2.5	c	n	n	F7	132	C2	2	172,C1	1987	21/A
Microburin	Mb prox	26.0	11.0	2.0	c	n	n	F7	172	D2	2C	132,C1	1987	21/A
Microburin	Mb prox	24.0	8.5	2.0	c	n	n	F1	409	AA4	2		1989	18/9
Microburin	Mb prox	5.0	3.0	1.0	c	n	y	-	419	AA4	2		1989	18/23
Microburin	Mb prox	14.0	7.0	2.0	c	n	n	F4	229	AA100	2		1988	18/13
Microburin	Mb dist	22.0	11.5	3.5	c	n	n	F4	-	-	surface		1984	
Microburin	Mb dist	19.0	8.5	2.0	c	n	n	F5	-	A99		55,91,134,158,173,214	1988	21/E
Microburin	Mb dist	16.0	6.0	2.0	c	n	n	F5	-	B1			1987	
Microburin	Mb dist	8.0	4.5	2.0	c	n	n	F7	-	B2			1987	
Microburin	Mb dist	19.0	9.0	1.5	c	n	n	F7	-	C1			1987	
Microburin	Mb dist	16.0	7.0	2.0	c	n	n	F7	-	C1		90	1987	21/C
Microburin	Mb dist	20.5	7.5	2.0	f	n	n	F7	2	B1	1 bottom		1987	18/10
Microburin	Mb dist	15.5	5.5	1.0	c	n	n	F1	22	C1	1 bottom		1987	18/17
Microburin	Mb dist	19.0	5.5	2.0	c	n	n	F1	75	A2	2		1987	18/14
Microburin	Mb dist	14.0	6.5	1.5	c	40%	n	F1	78	A2	2		1987	
Microburin	Mb dist	25.0	9.5	4.0	c	n	n	F7	90	C1	2	C1	1987	21/C
Microburin	Mb dist	34.5	12.5	2.5	c	n	n	F7	94	C1	2		1987	18/7
Microburin	Mb dist	22.0	8.0	2.0	c	n	n	F7	96	C1	2		1987	18/12

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Microburin	Mb dist	17.0	6.5	2.5	c	n	n	F1	108	A1	2		1987	18/16
Microburin	Mb dist	10.0	7.0	2.0	f	n	n	F5	134	D1	2C	55,91,158,173,214,A99	1987	21/E
Microburin	Mb dist	19.5	10.0	1.5	c	n	n	F5	173	D1	2C	55,91,134,158,214,A99	1987	21/E
Microburin	Mb dist	14.5	9.5	2.0	f	n	n	F7	204	C100	2A		1988	18/15
Microburin	Mb dist	15.0	8.0	2.0	c	n	n	F5	214	B100	2 top	55,91,134,158,173,A99	1988	21/E
Microburin	Mb dist	24.0	12.0	2.0	c	n	n	F1	218	B100	2	A1	1988	21/B
Microburin	Mb dist	25.5	10.0	2.5	c	n	n	F7	259	C3	2 top		1988	18/11
Microburin	Mb dist	8.0	6.5	1.5	c	n	n	F3	284	BB100	2		1988	18/20
Microburin	Mb dist	10.0	4.0	2.0	c	n	n	F7	297	E3	1 bottom		1989	18/22
Microburin	Mb dist	10.5	10.0	2.0	f	n	n	F7	317	B4	1 bottom	6	1989	25/M
Microburin	Mb dist	13.5	5.0	2.5	c	n	n	F1	365	AA4	2		1989	18/18
Microburin	Mb dist	6.0	6.0	1.5	c	n	y	-	402	AA3	2		1989	
Microburin	Mb dist	10.0	9.0	1.5	f	n	y	-	443	BB4	2		1989	18/21
Microburin	Mb double	15.0	10.0	2.0	c	n	n	F7	-	C1			1987	18/19
Crested blade		57.0	13.5	6.0	c	n	n	F2	24	E1	1 bottom		1987	18/24
Crested blade		19.5	8.0	5.0	c	n	n	F1	306	BB4	2	10,79,153,316,337	1989	22/B
Crested blade		30.0	12.0	4.0	c	40%	n	F1	167	A2	2	88	1987	22/F
Crested blade		18.5	8.0	3.0	f	n	n	F14	188	D2	2 bottom		1987	
Bladelet	1	27.0	12.0	3.0	c	100%	n	F4	-	A1			1987	
Bladelet	1	25.0	7.5	2.0	f	n	n	F7	147	B1	2	16,38,53,207	1987	22/A
Bladelet	1	24.0	12.5	1.5	f	n	n	F7	99	B2	2		1987	
Bladelet	1	39.0	13.0	6.0	c	30%	n	F10	145	B1	2		1987	
Bladelet	1	32.0	12.5	3.0	c	20%	n	F17	124	B2	2		1987	
Bladelet	1	24.0	8.0	3.0	f	n	n	F4	120	C2	2		1987	
Bladelet	1	26.5	6.5	1.5	f	n	n	F5	125	B2	2		1987	
Bladelet	1	25.0	12.0	2.0	c	50%	n	F1	88	B2	2	167	1987	22/F
Bladelet	1	25.0	10.0	1.5	c	n	n	F4	161	B1	2	192,445	1987	20/B
Bladelet	1	32.5	11.0	2.0	f	n	n	F4	59	B1	2		1987	
Bladelet	1	25.0	13.0	2.0	f	n	n	F5	55	D1	1 bottom	91,134,158,173,214,A99	1987	21/E
Bladelet	1	26.0	5.5	1.5	c	n	n	F1	43	A1	1 bottom		1987	
Bladelet	1	33.0	9.0	2.0	c	5%	n	F14	33	A1	1 bottom		1987	
Bladelet	1	26.0	11.0	2.5	f	n	y	-	29	C1	1 bottom		1987	
Bladelet	1	38.0	10.5	3.5	c	n	n	F7	80	C1	2		1987	

Bladelet	1	18.0	12.0	3.0	f	100%	n	F2	-	AA2			1988	
Bladelet	1	27.0	10.0	3.0	f	90%	n	F4	199	BB3	2		1988	
Bladelet	1	29.5	11.0	2.0	c	n	n	F14	179	E1	2C		1987	
Bladelet	1	36.0	10.5	2.5	f	n	y	-	165	B1	2		1987	
Bladelet	1	35.0	8.0	2.0	c	n	n	F4	201	BB6	2		1988	
Bladelet	1	27.0	6.5	2.0	f	n	y	F4	-	B1			1987	
Bladelet	1	27.0	11.0	2.5	f	50%	n	F14	240	AA2	2 top		1988	
Bladelet	1	26.0	7.5	2.0	f	n	n	F1	-	B2			1987	
Bladelet	1	26.5	5.0	5.0	c	5%	n	F4	321	CC3	1 bottom		1989	
Bladelet	1	33.0	9.0	3.0	c	n	n	F5	-	C1		112,124,201,213,B2,B3/2,surface	1987	21/D
Bladelet	1	31.0	11.0	3.0	c	5%	n	F4	187	D2	2 bottom		1987	
Bladelet	1	36.0	13.5	5.0	c	n	y	F14	180	E1	2C		1987	
Bladelet	1	21.0	10.0	2.0	f	n	n	F7	205	C100	2A	208	1988	25/H
Bladelet	1	19.0	14.0	3.0	f	n	n	F1	316	BB4	1 bottom	10,79,153,306,337	1989	22/B
Bladelet	1	24.0	11.5	2.0	f	n	n	F14	206	C100	2A	111	1988	25/D
Bladelet	1	31.0	11.5	3.0	c	n	n	F14	314	BB4	1 base		1989	
Bladelet	1	48.0	9.5	2.0	c	n	n	F7	207	C100	2A	16,38,53,147	1988	22/A
Bladelet	1	40.0	12.0	3.0	c	20%	n	F4	-	BB3	1 bottom		1989	
Bladelet	1	34.5	11.0	3.0	f	n	n	F7	208	C100	2A	205	1988	25/H
Bladelet	1	31.5	7.0	2.0	c	n	n	F4	-	E1			1987	
Bladelet	1	42.0	11.0	3.0	c	n	n	F5	202	B100	2	213	1988	21/D
Bladelet	1	37.0	11.0	5.0	c	5%	n	F3	-	D2			1987	
Bladelet	1	26.0	12.0	9.0	c	n	n	F4	269	BB2	2		1988	
Bladelet	1	25.0	6.0	1.5	f	n	n	F4	196	B100	1 bottom		1988	
Bladelet	1	33.0	5.5	2.0	c	n	n	F4	26	D2	1 bottom		1987	
Bladelet	1	25.0	10.5	3.5	c	25%	n	F4	13	B2	1 bottom		1987	
Bladelet	1	38.0	10.0	4.0	c	100%	n	F9	362	A3	2	372,433,B2,surface	1989	24/B
Bladelet	1	27.0	15.0	1.5	c	5%	n	F14	183	E1	2C		1987	
Bladelet	1	26.0	14.0	3.5	f	20%	n	F13	300	BB98	2		1989	
Bladelet	1	26.0	12.0	2.0	f	n	n	F5	213	B100	2 top	112,202,B2,B3,C1,surface	1988	21/D
Bladelet	1	34.0	12.0	6.0	c	50%	n	F4	260	D3	2 top		1988	
Bladelet	1	29.0	11.0	2.5	c	n	n	F8	222	C100	2		1988	
Bladelet	1	23.0	14.0	4.0	f	75%	n	F13	435	AA4	2		1989	
Bladelet	1	24.0	11.5	3.0	f	n	y	-	70	B2	2		1987	
Bladelet	1	36.0	9.0	2.0	c	n	n	F5	-	B2		112,124,201,213,B3,C1,surface	1987	21/D
Bladelet	1	35.0	12.0	7.0	c	80%	n	F2	-	AA1	2 top		1987	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Bladelet	l	31.0	11.0	2.0	c	n	n	F14	150	B1	2		1987	
Microbladelet	ll	18.0	9.5	4.5	c	n	n	F1	-	A3	2	364,367,390,391	1989	24/C
Microbladelet	ll	15.0	7.0	2.0	f	n	n	F4	-	AA1	2 top		1987	
Microbladelet	ll	23.0	6.0	1.5	f	n	y	F14	-	B1			1987	
Microbladelet	ll	14.0	13.0	2.5	f	n	y	-	-	B1			1987	
Microbladelet	ll	24.0	12.5	2.0	f	n	n	F4	-	A99	2		1988	
Microbladelet	ll	18.0	9.0	1.5	f	n	n	F14	27	D1	1 bottom		1987	
Microbladelet	ll	17.5	9.0	2.0	f	n	n	F7	53	C1	2	16.53,147,207	1987	22/A
Microbladelet	ll	11.0	7.0	1.0	f	n	n	F4	-	D2			1987	
Microbladelet	ll	12.0	11.0	1.5	f	n	n	F4	-	B2			1987	
Microbladelet	ll	9.0	10.5	1.5	f	n	y	-	14	B2	1 bottom		1987	
Microbladelet	ll	22.5	7.5	2.5	f	n	n	F4	34	A1	1 bottom		1987	
Microbladelet	ll	15.5	10.0	3.5	f	n	n	F1	153	A2	2	10,79,306,316,337	1987	22/B
Microbladelet	ll	22.0	12.0	3.0	f	n	y	-	-	C1		132,172	1987	21/A
Microbladelet	ll	17.0	9.0	1.5	f	n	n	F4	151	B1	2		1987	
Microbladelet	ll	26.5	11.0	2.5	f	n	n	F5	-	B3	2	112,124,201,213,B2,C1,surface	1988	21/D
Microbladelet	ll	14.5	8.0	2.0	f	n	n	F1	-	A1		218	1989	21/B
Microbladelet	ll	16.0	9.0	2.0	f	50%	n	F7	110	C1	2A		1987	
Microbladelet	ll	9.5	7.0	2.0	f	n	n	F7	129	C2	2	5,23,37	1987	25/I
Microbladelet	ll	20.5	7.5	1.5	f	n	n	F1	50	A2	1 bottom	A2	1987	22/E
Microbladelet	ll	16.0	12.0	2.0	f	n	n	F7	126	C1	2		1987	
Microbladelet	ll	21.0	8.0	1.5	c	n	n	F4	45	A1	1 bottom		1987	
Microbladelet	ll	15.0	6.0	2.0	f	n	n	F1	-	A2		50	1987	22/E
Microbladelet	ll	14.5	8.5	2.0	f	n	y	-	143	B2	2 bottom		1987	
Microbladelet	ll	15.0	10.0	3.0	f	n	n	F1	154	A2	2		1987	
Microbladelet	ll	14.5	10.0	1.5	f	n	n	F7	139	D1	2C	138	1987	25/B
Microbladelet	ll	10.0	7.0	2.0	f	n	y	-	54	C1	2		1987	
Microbladelet	ll	11.5	6.0	1.0	f	n	n	F4	44	A1	1 bottom		1987	
Microbladelet	ll	20.0	10.0	2.0	f	n	n	F4	106	A1	2		1987	
Microbladelet	ll	16.5	6.0	1.0	f	n	n	F1	133	D1	2C		1987	
Microbladelet	ll	18.0	10.0	1.5	f	n	n	F7	95	C1	2A		1987	
Microbladelet	ll	16.0	9.0	2.0	f	n	y	-	-	C1			1987	
Microbladelet	ll	23.0	10.5	3.5	f	80%	n	F3	104	A1	2		1987	

Microbladelet	II	17.0	6.5	2.0	f	n	n	F7	-	C1			1987	
Microbladelet	II	18.0	7.5	2.5	f	n	n	F4	140	D1	2C		1987	
Microbladelet	II	11.5	11.5	1.5	f	n	n	F7	37	B2	1 bottom	5,23,129	1987	25/I
Microbladelet	II	17.5	10.5	1.0	f	n	n	F7	25	C1	1 bottom		1987	
Microbladelet	II	12.5	10.0	2.0	f	n	n	F14	111	C1	2A	206	1987	25/D
Microbladelet	II	12.0	5.5	2.5	f	n	n	F4	42	A1	1 bottom		1987	
Microbladelet	II	17.0	9.0	4.0	f	n	n	F14	-	C3			1988	
Microbladelet	II	22.5	10.0	2.0	f	n	n	F14	-	B2			1987	
Microbladelet	II	22.0	11.0	4.0	f	n	n	F6	57	B1	2	160	1987	25/A
Microbladelet	II	22.0	6.5	3.0	f	50%	n	F3	73	A2	2		1987	
Microbladelet	II	13.5	6.0	2.0	f	n	n	F4	-	B1		B1	1987	22/D
Microbladelet	II	14.0	8.5	1.5	f	n	n	F4	102	A1	2		1987	
Microbladelet	II	15.5	9.0	3.0	f	n	n	F1	79	A2	2	10,153,306,316,337	1987	22/B
Microbladelet	II	16.0	8.0	1.5	f	n	n	F4	130	C1	2		1987	
Microbladelet	II	18.0	10.0	2.0	f	n	y	F7	164	B1	2		1987	
Microbladelet	II	12.0	6.0	2.0	f	n	y	-	100	B2	2		1987	
Microbladelet	II	13.0	6.0	1.5	f	n	n	F7	84	C1	2		1987	
Microbladelet	II	15.0	8.0	1.5	f	n	n	F7	-	C1			1987	
Microbladelet	II	19.5	10.0	2.0	f	n	y	F1	74	A2	2		1987	
Microbladelet	II	14.5	11.0	2.0	f	n	y	-	85	C2	2		1987	
Microbladelet	II	20.5	9.5	2.0	f	n	y	F5	47	A2	1 bottom		1987	
Microbladelet	II	11.0	6.0	1.5	f	n	n	F7	92	C1	2		1987	
Microbladelet	II	14.0	11.5	2.5	c	n	n	F4	83	C1	2		1987	
Microbladelet	II	9.0	12.0	1.5	f	n	n	F5	91	C1	2	55,134,158,173,214,A99	1987	21/E
Microbladelet	II	11.5	8.0	2.5	f	n	n	F7	-	C1			1987	
Microbladelet	II	19.0	12.5	2.0	f	n	n	F3	32	A1	1 bottom	3,46,221	1987	20/C
Microbladelet	II	13.0	9.0	2.0	f	n	y	-	-	B1			1987	
Microbladelet	II	13.5	8.0	1.5	f	n	y	F7	23	C2	1 bottom	5,37,129	1987	25/I
Microbladelet	II	18.0	10.0	1.5	f	n	n	F7	138	D1	2C	139	1987	25/B
Microbladelet	II	15.0	7.0	1.0	f	n	n	F3	3	B2	1 bottom	32,46,221	1987	20/C
Microbladelet	II	29.0	9.0	1.5	f	n	n	F7	38	C1	1 bottom	16.53,147,203	1987	22/A
Microbladelet	II	22.0	10.0	2.0	f	n	n	F7	16	C2	1 bottom	38.53,147,207	1987	22/A
Microbladelet	II	12.5	6.5	1.5	f	n	n	F4	-	C100			1988	
Microbladelet	II	10.0	7.0	1.0	f	n	n	F4	271	BB2	2		1988	
Microbladelet	II	19.5	9.0	1.5	f	n	n	F3	356	A4	2		1989	
Microbladelet	II	12.5	6.5	1.0	f	5%	n	F3	35	A1	1 bottom		1987	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Microbladelet	ll	17.0	7.5	1.5	f	n	n	F3	166	B1	2		1987	
Microbladelet	ll	16.0	6.0	2.0	f	n	n	F4	-	A2	1		1987	
Microbladelet	ll	16.0	14.0	3.0	f	n	n	F3	278	BB100	2		1988	
Microbladelet	ll	11.0	12.0	2.0	f	n	y	-	19	C1	1 bottom		1987	
Microbladelet	ll	18.0	12.0	3.0	f	n	n	F4	287	BB100	2		1988	
Microbladelet	ll	11.0	11.0	2.0	f	n	y	-	209	C100	2A		1988	
Microbladelet	ll	7.0	9.0	3.0	f	n	y	-	255	B3	2 top		1988	
Microbladelet	ll	15.0	13.0	5.0	c	n	n	F13	437	BB3	2		1989	
Microbladelet	ll	13.5	12.0	3.0	f	n	y	-	451	BB3	2		1989	
Microbladelet	ll	17.0	12.5	2.0	f	n	n	F4	198	BB3	2		1988	
Microbladelet	ll	20.0	7.0	2.0	c	n	n	F1	397	AA4	2		1989	
Microbladelet	ll	14.0	8.5	4.0	f	25%	n	F14	197	B100	2 top		1988	
Microbladelet	ll	19.0	6.0	1.5	f	n	n	F3	275	BB2	2		1988	
Microbladelet	ll	10.5	9.0	1.0	f	n	y	-	210	C100	2A		1988	
Microbladelet	ll	19.5	10.0	2.0	f	75%	n	F4	394	AA4	2		1989	
Microbladelet	ll	16.0	9.0	2.0	f	n	y	F7	190	A2	2 bottom		1987	
Microbladelet	ll	14.5	9.0	3.0	f	25%	y	-	277	BB100	2		1988	
Microbladelet	ll	24.0	10.0	4.5	f	n	n	F4	228	AA99	2		1988	
Microbladelet	ll	11.0	9.0	2.5	f	n	n	F4	282	BB100	2		1988	
Microbladelet	ll	18.0	6.0	1.5	f	n	y	F1	178	E2	2C		1987	
Microbladelet	ll	22.0	8.5	3.0	f	n	n	F1	337	AA3	2	10,79,153,306,316	1989	21/B
Microbladelet	ll	15.0	5.0	1.0	c	n	n	F4	185	D2	2 bottom		1987	
Microbladelet	ll	17.5	11.0	3.0	f	n	n	F1	358	A3	2		1989	
Microbladelet	ll	18.0	8.5	2.0	c	50%	n	F4	421	AA3	2		1989	
Microbladelet	ll	23.5	10.0	2.0	c	n	n	F4	267	BB2	2		1988	
Microbladelet	ll	19.5	7.0	2.0	f	n	n	F4	171	B1	2 bottom		1987	
Microbladelet	ll	11.5	5.5	1.0	f	n	n	F4	291	D3	2	surface	1988	25/E
Microbladelet	ll	19.5	7.5	3.0	f	n	n	F1	170	B1	2 bottom	67	1987	25/A
Microbladelet	ll	23.5	7.0	2.0	c	n	y	F3	406	AA4	2		1989	
Microbladelet	ll	17.0	7.0	1.5	f	n	n	F4	203	C100	2A		1988	
Microbladelet	ll	20.0	8.5	2.5	f	n	n	F4	258	C3	2 top		1988	
Microbladelet	ll	18.0	10.0	2.0	f	n	n	F13	248	AA2	2 top		1988	
Microbladelet	ll	18.0	4.5	2.5	f	n	n	F4	289	BB100	2		1988	

Microbladelet	II	20.0	7.0	2.0	f	n	y	-	329	D4	Pit 10		1989	
Microbladelet	II	21.0	6.0	2.0	f	n	n	F1	361	A3	2		1989	
Microbladelet	II	11.5	7.0	0.5	f	5%	n	F4	323	AA3	2		1989	
Microbladelet	II	11.5	5.5	1.0	f	10%	n	F3	261	BB1	2 top		1988	
Microbladelet	II	22.0	9.0	6.5	f	n	n	F4	373	AA4	2		1989	
Microbladelet	II	23.0	7.0	4.5	c	10%	n	F4	375	A3	2		1989	
Microbladelet	II	19.0	10.5	2.5	f	n	n	F3	292	C3	2		1988	
Microbladelet	II	17.5	8.0	3.0	f	90%	y	F4	366	A3	2		1989	
Microbladelet	II	17.0	8.0	2.0	f	n	n	F4	445	BB4	2	161,192	1989	20/B
Microbladelet	II	13.5	6.0	1.5	f	n	n	F3	131	C1	2		1987	
Microbladelet	II	12.0	3.0	1.0	f	50%	n	F3	175	B1	2 bottom		1987	
Microbladelet	II	10.0	9.0	1.5	f	n	y	-	86	C1	2		1987	
Microbladelet	II	18.0	7.0	1.5	c	5%	y	F1	450	BB4	2		1989	
Microbladelet	II	14.0	9.0	1.5	f	n	n	F7	6	C2	1 bottom	317	1987	25/M
Microbladelet	II	13.0	5.0	2.0	c	n	n	F4	285	BB100	2		1988	
Microbladelet	II	24.0	8.0	1.5	c	n	n	F14	89	B2	2		1987	
Microbladelet	II	10.5	7.0	3.0	f	n	n	F1	308	A4	1 bottom		1989	
Microbladelet	II	23.5	11.0	3.0	f	n	n	F4	200	BB4	2		1988	
Microbladelet	II	13.0	7.0	2.5	f	n	y	-	280	BB2	2		1988	
Microbladelet	II	15.0	10.0	2.0	f	n	n	F3	219	B100	2	159	1988	25/F
Microbladelet	II	13.5	5.0	3.0	c	n	y	-	237	AA2	2 top		1988	
Microbladelet	II	19.0	10.0	3.0	c	10%	n	F4	272	BB2	2		1988	
Microbladelet	II	17.5	5.0	1.0	f	n	n	F4	403	AA3	2		1989	
Microbladelet	II	17.5	8.5	3.0	f	n	n	F4	176	B1	2 bottom	107	1987	25/C
Microbladelet	II	10.5	6.0	1.5	f	30%	n	F4	241	AA2	2 top		1988	
Microbladelet	II	14.0	8.0	2.0	f	n	n	F3	221	A100	2 top	3,32,46	1988	20/C
Microbladelet	II	8.0	8.0	1.0	f	n	n	F4	186	D2	2 bottom		1987	
Microbladelet	II	14.0	9.0	2.0	f	n	n	F4	184	E1	2C		1987	
Microbladelet	II	19.5	9.5	2.5	c	40%	n	F4	423	AA3	2		1989	
Microbladelet	II	11.0	8.5	2.0	f	10%	n	F3	182	E1	2C		1987	
Hypermicrobladelet	III	7.5	5.0	2.0	f	n	n	F4	-	C1			1987	
Hypermicrobladelet	III	5.5	3.0	0.5	f	n	n	F4	231	AA99	2		1988	
Hypermicrobladelet	III	6.5	5.0	0.5	f	n	n	F3	175	B1	2 bottom		1987	
Hypermicrobladelet	III	10.0	3.0	1.5	c	n	n	F3	-	C1			1987	
Hypermicrobladelet	III	11.5	7.5	1.0	f	n	n	F13	374	AA3	2		1989	
Hypermicrobladelet	III	9.0	5.0	1.5	f	n	n	F4	-	A1			1989	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Hypermicrobladelet	lll	7.0	5.0	1.0	f	n	n	F3	211	C100	2A		1988	
Hypermicrobladelet	lll	7.5	5.5	0.5	f	n	n	F1	155	B2	2		1987	
Hypermicrobladelet	lll	11.0	5.0	2.0	c	50%	y	-	436	BB3	2		1989	
Hypermicrobladelet	lll	11.0	6.0	1.5	f	n	y	-	422	AA4	2		1989	
Hypermicrobladelet	lll	9.0	5.5	1.0	f	n	n	F13	283	BB100	2		1988	
Hypermicrobladelet	lll	10.5	5.0	1.5	c	n	n	F4	239	AA2	2 top		1988	
Hypermicrobladelet	lll	10.0	4.0	0.5	c	n	n	F4	-	C1			1987	
Hypermicrobladelet	lll	10.0	5.0	2.0	c	50%	n	F1	-	A2			1987	
Hypermicrobladelet	lll	11.0	9.0	2.0	c	n	n	F4	249	BB2	2 top		1988	
Hypermicrobladelet	lll	6.5	4.0	1.0	f	n	n	F4	268	BB2	2		1988	
Hypermicrobladelet	lll	11.0	3.5	1.5	c	n	n	F4	-	A1			1987	
Flake	E	57.0	35.5	5.5	c	90%	n	F9	372	AA4	2	362,433,B2,surface	1989	24/B
Flake	E	53.0	39.0	15.0	c	95%	n	F1	391	AA3	2	364,367,390,A3/2	1989	24/C
Flake	E	55.0	34.0	14.0	c	25%	n	F1	364	A3	2	367,390,391,A3/2	1989	24/C
Small flake	e	28.5	24.0	12.0	c	25%	n	F5	118	C2	2	30	1987	22/G
Small flake	e	35.0	26.0	18.0	c	50%	n	F2	-	AA1	2 top		1987	
Small flake	e	30.0	25.0	3.0	c	n	n	F1	-	AA1	2 top		1987	
Small flake	e	20.5	24.0	4.0	c	30%	n	F7	117	C2	2		1987	
Small flake	e	18.0	30.0	10.0	c	40%	n	F4	242	AA2	1	A100/2,surface,surface,surface	1988	23/G
Small flake	e	25.0	19.0	3.0	c	100%	n	F9	404	AA3	2	surface	1989	23/A
Small flake	e	28.0	18.5	5.5	c	n	n	F7	116	C2	2	AA2	1987	25/L
Small flake	e	33.0	29.0	7.5	c	100%	n	F9	433	AA4	2	362,372,B2,surface	1989	24/B
Small flake	e	24.0	14.0	6.0	f	n	y	F7	113	C1	2		1987	
Small flake	e	35.0	31.0	13.5	c	10%	n	F4	273	BB100	2	286,surface	1988	23/C
Small flake	e	15.5	19.0	5.5	f	90%	n	F4	263	BB1	2		1988	
Small flake	e	28.0	24.0	6.0	f	n	n	F1	245	AA2	2 top	15	1988	23/F
Small flake	e	26.0	14.0	7.0	c	n	n	F4	235	AA1	2 top		1988	
Small flake	e	30.0	39.0	4.0	c	100%	n	F12	357	A3	2	122,157,293,296,327,328,408,B1	1989	24/A
Small flake	e	24.0	21.0	8.0	c	60%	n	F12	293	AA4	1 bottom	122,157,296,327,328,357,408,B1	1989	24/A
Small flake	e	30.0	23.0	12.0	c	50%	n	F12	327	A3	2	122,157,293,296,328,357,408,B1	1989	24/A
Small flake	e	28.0	18.0	4.0	c	25%	n	F4	-	A1	1		1987	
Small flake	e	37.0	33.0	9.0	c	50%	n	F9	389	AA4	2		1989	
Small flake	e	22.0	10.0	2.0	c	100%	n	F12	408	AA4	2	122,157,293,296,327,328,357,B1	1989	24/A

Small flake	e	28.0	23.0	5.0	c	10%	n	F13	41	A2	1 bottom	BB2,BB2	1987	23/D
Small flake	e	40.0	38.5	12.0	c	20%	n	F12	328	A3	2	122,157,293,296,327,357,408,B1	1989	24/A
Small flake	e	23.0	26.0	4.0	c	30%	n	F4	447	BB3	2		1989	
Small flake	e	25.0	14.0	1.5	f	5%	n	F4	333	E4	2		1989	
Small flake	e	25.5	23.5	11.0	c	50%	n	F4	195	B100	2 top		1988	
Small flake	e	31.0	26.0	5.0	c	n	n	F2	193	E100	2 top		1988	
Small flake	e	17.0	27.0	9.0	c	20%	n	F4	319	CC3	1 bottom		1989	
Small flake	e	28.0	15.5	5.0	c	90%	y	-	-	BB2	2 top		1988	
Microflake	ee	13.0	15.0	3.0	c	n	n	F7	-	B1			1987	
Microflake	ee	17.0	15.0	1.5	c	n	n	F4	11	B1	1 bottom	18	1987	23/E
Microflake	ee	15.0	13.0	5.0	f	25%	n	F4	7	A1	1 bottom		1987	
Microflake	ee	15.0	9.0	5.0	c	30%	n	F1	-	B2			1987	
Microflake	ee	20.0	18.0	4.0	c	50%	n	F7	-	C2			1987	
Microflake	ee	22.0	27.0	5.0	c	n	n	F4	163	B1	2		1987	
Microflake	ee	16.5	20.0	3.0	c	n	n	F4	-	B1			1987	
Microflake	ee	19.0	14.0	3.0	f	n	n	F7	-	AA2		116	1988	25/L
Microflake	ee	13.0	9.0	3.5	c	n	n	F4	-	C1			1987	
Microflake	ee	13.0	11.5	2.0	c	n	n	F4	162	B1	2		1987	
Microflake	ee	16.0	9.5	2.5	c	n	n	F1	-	A2			1987	
Microflake	ee	18.5	7.5	3.5	c	n	n	F4	-	AA1	2 top		1987	
Microflake	ee	13.0	11.0	1.5	c	n	n	F7	31	D1	1		1987	
Microflake	ee	13.5	7.5	3.0	f	n	n	F5	158	B2	2	55,91,134,173,214,A99	1987	21/E
Microflake	ee	14.0	10.0	1.0	f	n	n	F4	-	B1			1987	
Microflake	ee	16.0	13.0	4.0	c	n	n	F4	-	A1			1987	
Microflake	ee	13.0	11.5	2.0	c	n	n	F13	-	BB4	2		1989	
Microflake	ee	21.0	7.0	5.0	c	100%	n	F12	157	B2	2	122,293,296,327,328,357,408,B1	1987	24/A
Microflake	ee	18.0	23.0	5.0	c	n	n	F2	-	BB2	2	41	1988	23/D
Microflake	ee	17.0	14.0	3.5	c	50%	n	F4	-	AA2			1988	
Microflake	ee	13.0	9.5	2.5	f	25%	n	F4	49	A2	1 bottom		1987	
Microflake	ee	11.5	10.0	3.5	f	n	n	F6	160	B1	2	57	1987	25/A
Microflake	ee	12.5	9.5	2.5	c	n	n	F1	20	C1	1 bottom		1987	
Microflake	ee	15.0	19.0	2.5	c	n	n	F13	58	B1	2		1987	
Microflake	ee	22.0	28.0	5.0	c	n	n	F4	18	C1	1 bottom	11	1987	23/E
Microflake	ee	16.0	10.0	3.0	c	n	y	-	-	AA2			1988	
Microflake	ee	11.0	17.0	3.0	c	5%	n	F4	-	B2			1987	
Microflake	ee	23.0	12.0	3.0	f	n	n	F4	105	A1	2		1987	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Microflake	ee	17.0	9.0	1.5	c	n	n	F4	-	C1			1987	
Microflake	ee	13.0	14.0	2.5	c	n	n	F4	103	A1	2		1987	
Microflake	ee	17.0	14.5	3.0	f	5%	n	F14	9	A2	1		1987	
Microflake	ee	22.0	27.0	9.0	c	25%	n	F4	66	B2	2		1987	
Microflake	ee	19.0	19.5	6.0	c	n	n	F4	1	A1	1 bottom	215	1987	23/B
Microflake	ee	17.5	9.0	1.5	f	n	y	F5	148	B1	2		1987	
Microflake	ee	13.0	13.5	3.5	f	5%	n	F2	-	B2			1987	
Microflake	ee	15.0	10.0	2.0	c	n	n	F4	-	BB4	1 bottom		1989	
Microflake	ee	16.0	20.5	5.5	c	n	n	F9	48	A2	1 bottom		1987	
Microflake	ee	20.0	12.5	9.0	c	25%	n	F5	30	C1	1 bottom	118	1987	22/G
Microflake	ee	18.0	12.0	5.0	c	90%	n	F1	-	B2			1987	
Microflake	ee	14.0	8.0	5.0	c	n	n	F1	68	B5	2		1987	
Microflake	ee	17.0	9.0	1.5	f	n	n	F4	144	B1	2 bottom		1987	
Microflake	ee	12.0	6.5	1.0	c	n	n	F4	149	B1	2		1987	
Microflake	ee	13.5	9.5	1.0	c	n	n	F4	-	AA2			1988	
Microflake	ee	14.0	10.0	2.5	f	n	n	F4	107	A1	2	176	1987	25/C
Microflake	ee	20.5	16,6	7.5	f	50%	n	F4	142	B2	2 bottom		1987	
Microflake	ee	14.0	8.0	3.0	c	50%	n	F4	236	AA1	2 top		1988	
Microflake	ee	13.0	7.0	1.5	c	n	n	F9	86	C1	2		1987	
Microflake	ee	15.0	20.0	4.0	c	n	n	F4	169	A2	2 bottom		1987	
Microflake	ee	20.0	14.0	7.0	c	30%	n	F4	-	AA1	2 top		1987	
Microflake	ee	12.0	13.0	3.5	f	n	n	F1	253	B3	2 top		1988	
Microflake	ee	14.0	11.0	2.0	c	n	n	F4	290	BB100	2		1988	
Microflake	ee	9.0	20.0	4.0	c	20%	n	F4	243	AA2	1		1988	
Microflake	ee	13.0	15.0	6.0	f	n	n	F4	304	BB3	2		1989	
Microflake	ee	17.0	17.0	5.0	f	n	n	F4	286	BB100	2	273,surface	1988	23/C
Microflake	ee	13.0	18.0	8.0	c	25%	n	F4	226	AA99	2		1988	
Microflake	ee	12.0	12.0	2.5	f	50%	n	F4	299	AA2	2		1989	
Microflake	ee	23.0	19.0	5.0	c	30%	n	-	295	A4	1 bottom		1989	
Microflake	ee	16.0	16.0	2.5	c	10%	n	F1	367	A3	2	364,390,391,A3/2	1989	24/C
Microflake	ee	11.0	15.0	2.0	c	n	n	F4	232	AA2	2 top		1988	
Microflake	ee	10.0	14.0	4.0	f	n	y	-	413	AA4	2		1989	
Microflake	ee	15.0	16.5	4.5	c	n	n	F4	191	A1	2 bottom		1987	

Microflake	ee	13.0	13.0	2.0	c	n	n	F2	449	BB4	2		1989	
Microflake	ee	20.0	22.0	10.0	c	n	n	F4	238	AA2	2 top		1988	
Microflake	ee	17.0	12.0	6.0	f	10%	y	-	384	AA3	2		1989	
Microflake	ee	15.0	12.0	3.0	f	n	n	F13	320	CC3	1 bottom		1989	
Microflake	ee	17.0	16.0	5.0	c	n	n	F4	386	AA3	2		1989	
Microflake	ee	12.5	11.0	2.0	c	75%	n	F4	322	AA3	2		1989	
Microflake	ee	20.0	10.0	5.0	f	n	y	-	335	AA3	2		1989	
Microflake	ee	13.0	7.0	3.0	f	60%	n	F1	324	A3	2		1989	
Microflake	ee	16.5	10.0	3.0	f	n	y	-	407	AA3	2		1989	
Microflake	ee	13.0	14.0	6.0	c	100%	n	F9	-	B1			1987	
Microflake	ee	10.0	15.0	2.0	f	100%	n	F4	448	CC3	2		1989	
Microflake	ee	10.0	8.0	1.5	f	n	n	F4	230	BB99	2		1988	
Microflake	ee	17.5	17.0	3.0	c	40%	n	F1	390	AA4	2	364,367,391,A3/2	1989	24/C
Microflake	ee	23.0	22.0	5.0	c	n	n	F4	215	B100	2 top	1	1988	23/B
Microflake	ee	15.0	7.5	3.0	f	100%	y	-	381	AA3	2		1989	
Microflake	ee	21.0	14.5	3.0	c	50%	n	F7	189	D2	2 bottom		1987	
Microflake	ee	13.5	14.0	1.0	f	n	n	F13	441	BB3	2		1989	
Microflake	ee	23.0	15.0	8.0	c	10%	n	F4	220	B100	2		1988	
Microflake	ee	13.0	9.5	2.5	c	5%	n	F4	359	A3	2		1989	
Microflake	ee	15.0	11.0	6.5	c	50%	n	F4	-	AA2			1988	
Microflake	ee	9.0	13.0	1.5	c	n	n	F1	380	B4	2		1989	
Microflake	ee	11.0	13.0	2.0	f	100%	n	-	270	BB1	2		1988	
Microflake	ee	15.5	10.0	2.0	f	n	y	-	310	AA4	1 base		1989	
Microflake	ee	13.0	17.5	3.0	f	n	n	F13	247	AA2	2 top		1988	
Microflake	ee	15.5	15.0	5.0	f	10%	y	-	246	AA2	1		1988	
Microflake	ee	12.5	7.5	1.0	c	10%	n	F4	315	BB4	1 bottom		1989	
Microflake	ee	12.0	17.0	5.0	f	n	y	-	396	AA3	2		1989	
Small flake	ee	10.0	26.0	2.0	c	75%	n	F11	392	AA3	2		1989	
Microflake	ee	19.0	11.0	3.0	f	90%	y	-	434	AA4	2		1989	
Microflake	ee	14.0	19.5	4.0	c	n	n	F13	371	A3	2		1989	
Microflake	ee	10.0	19.5	2.0	c	n	n	F13	429	AA3	2		1989	
Microflake	ee	13.0	8.0	2.5	c	n	n	F4	-	B1		B1	1987	22/D
Microflake	ee	14.0	13.0	1.5	f	n	n	F7	5	C2	1 bottom	23,37,129	1987	25/I
Microflake	ee	19.0	11.0	1.0	c	n	n	F7	4	C2	1 bottom		1987	
Microflake	ee	11.0	16.0	5.5	c	n	n	F4	-	B100	2		1988	
Microflake	ee	14.0	6.0	3.5	c	n	n	F7	-	D1			1987	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Hypermicroflake	eee	10.0	5.5	1.5	c	n	n	F4	72	B2	2		1987	
Hypermicroflake	eee	11.5	8.0	3.0	c	10%	n	F4	36	A2	1 bottom		1987	
Hypermicroflake	eee	12.0	12.0	2.0	c	n	n	F1	71	B2	2		1987	
Hypermicroflake	eee	11.0	6.0	1.0	c	n	n	F4	-	A4	2		1989	
Hypermicroflake	eee	11.5	8.0	1.0	c	n	n	F1	64	B2	2		1987	
Hypermicroflake	eee	7.0	12.5	2.0	c	5%	n	F1	63	B2	2		1987	
Hypermicroflake	eee	12.0	5.5	4.5	f	n	n	F4	61	B1	2		1987	
Hypermicroflake	eee	7.0	10.5	1.5	c	n	n	F4	-	A2			1987	
Hypermicroflake	eee	10.0	8.5	2.0	c	n	n	F1	15	B2	1 bottom	245	1987	23/F
Hypermicroflake	eee	9.0	7.0	2.5	f	n	n	F9	93	C1	2		1987	
Hypermicroflake	eee	10.0	5.5	2.5	f	n	y	-	-	AA2			1988	
Hypermicroflake	eee	10.0	12.0	2.0	c	n	n	F13	-	AA2			1988	
Hypermicroflake	eee	9.0	12.5	2.0	c	100%	n	-	-	AA2			1988	
Hypermicroflake	eee	6.0	11.0	2.0	c	n	n	F4	-	A2			1987	
Hypermicroflake	eee	9.5	7.5	3.5	c	n	n	F1	-	A3	2		1989	
Hypermicroflake	eee	11.0	9.0	2.0	c	100%	n	F4	-	A2			1987	
Hypermicroflake	eee	11.0	11.0	4.0	f	20%	y	F2	-	BB100	2		1988	
Hypermicroflake	eee	9.0	7.0	1.0	f	n	n	F1	156	B2	2		1987	
Hypermicroflake	eee	10.0	6.0	1.0	c	n	n	F4	-	A1			1989	
Hypermicroflake	eee	12.0	8.5	3.0	c	n	n	F4	12	B2	1		1987	
Hypermicroflake	eee	10.0	3.0	4.0	f	100%	y	-	-	A1			1989	
Hypermicroflake	eee	7.5	7.5	2.0	f	100%	n	F4	-	A2			1987	
Hypermicroflake	eee	10.0	10.0	1.0	f	n	y	-	-	D2			1987	
Hypermicroflake	eee	10.0	8.0	1.0	f	n	n	F4	-	BB3	1 bottom		1989	
Hypermicroflake	eee	7.0	9.5	2.5	f	100%	n	-	-	E1			1987	
Hypermicroflake	eee	9.5	11.5	1.5	c	n	n	F4	-	AA1	2 top		1987	
Hypermicroflake	eee	10.0	8.5	1.5	f	50%	y	-	-	BB3	2		1989	
Hypermicroflake	eee	6.5	7.0	2.0	c	n	n	F4	-	C1			1987	
Hypermicroflake	eee	8.0	6.0	1.0	f	5%	n	F7	-	A2			1987	
Hypermicroflake	eee	10.0	5.5	1.0	c	n	n	F4	-	A1			1989	
Hypermicroflake	eee	10.0	10.0	2.0	f	n	y	-	-	BB100	2		1988	
Hypermicroflake	eee	9.0	9.0	3.0	f	50%	n	F9	-	C3			1988	
Hypermicroflake	eee	9.0	6.5	2.0	f	n	n	F1	309	BB4	1		1989	

Hypermicroflake	eee	11.0	8.0	4.0	f	n	y	-	417	AA3	2		1989	
Hypermicroflake	eee	11.5	13.0	3.0	c	5%	n	F13	418	AA4	2		1989	
Hypermicroflake	eee	9.0	6.0	2.0	c	25%	n	F2	-	C2			1987	
Hypermicroflake	eee	6.0	11.0	6.0	c	10%	n	F4	281	BB100	2		1988	
Hypermicroflake	eee	5.0	5.0	2.0	f	n	n	F4	-	A1			1989	
Hypermicroflake	eee	7.0	9.0	2.0	f	100%	n	-	446	BB3	2		1989	
Hypermicroflake	eee	9.5	6.0	1.0	c	n	n	F4	-	C2			1987	
Hypermicroflake	eee	11.5	12.0	1.5	c	n	n	F1	177	B1	2 bottom		1987	
Hypermicroflake	eee	10.0	7.0	2.0	f	100%	n	-	-	AA1	2 top		1987	
Hypermicroflake	eee	9.5	13.0	2.0	c	5%	n	F4	194	A100	2 top		1988	
Hypermicroflake	eee	8.0	8.0	2.0	c	n	n	F9	-	A1	1		1987	
Hypermicroflake	eee	10.0	12.0	3.5	f	n	y	-	279	BB2	2		1988	
Hypermicroflake	eee	7.5	6.0	2.0	f	n	n	F14	-	C1			1987	
Hypermicroflake	eee	8.5	5.0	1.0	f	n	n	F4	395	AA4	2		1989	
Hypermicroflake	eee	8.0	7.5	2.0	c	n	n	F13	303	AA3	1 bottom		1989	
Hypermicroflake	eee	9.5	11.5	2.0	c	n	n	F4	393	AA4	2		1989	
Hypermicroflake	eee	9.0	6.0	1.0	c	n	n	F13	307	BB3	1 bottom		1989	
Hypermicroflake	eee	7.0	5.0	1.0	f	n	y	-	276	BB2	2		1988	
Hypermicroflake	eee	10.0	10.5	3.0	f	50%	n	F4	-	A100	2 top	242,surface,surface,surface	1988	23/G
Hypermicroflake	eee	9.0	4.0	1.0	f	n	n	F4	284	BB100	2		1988	
Hypermicroflake	eee	8.0	6.0	1.5	c	n	n	F4	301	AA3	1 bottom		1989	
Hypermicroflake	eee	8.0	4.0	2.0	c	25%	y	-	399	AA4	2		1989	
Hypermicroflake	eee	12.0	7.5	1.5	c	10%	n	F13	288	BB100	2		1988	
Hypermicroflake	eee	5.5	6.5	0.5	c	n	y	-	251	AA2	2		1988	
Hypermicroflake	eee	8.0	7.0	2.0	f	n	y	-	377	AA3	2		1989	
Hypermicroflake	eee	9.0	7.0	3.0	c	n	n	F4	401	AA3	2		1989	
Hypermicroflake	eee	8.5	5.5	1.0	f	n	n	F1	370	AA4	2		1989	
Hypermicroflake	eee	7.5	7.0	1.5	f	n	n	F4	234	AA1	2 top		1988	
Hypermicroflake	eee	7.0	7.0	2.0	c	n	n	F13	313	BB4	1 bottom		1989	
Hypermicroflake	eee	8.0	4.0	3.0	f	n	y	-	266	BB1	2		1988	
Hypermicroflake	eee	5.0	6.0	1.0	c	n	n	F3	383	AA4	2		1989	
Hypermicroflake	eee	7.5	10.0	3.0	f	25%	n	F3	233	AA2	2 top		1988	
Hypermicroflake	eee	7.0	8.0	2.0	f	10%	n	F9	385	AA4	2		1989	
Hypermicroflake	eee	10.0	7.0	1.5	c	n	n	F4	405	AA4	2		1989	
Hypermicroflake	eee	9.5	10.0	3.5	f	n	n	F4	331	A3	2		1989	
Hypermicroflake	eee	7.5	4.0	0.5	c	n	n	F13	265	BB2	2		1988	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Hypermicroflake	eee	8.0	10.0	2.0	c	n	n	F4	-	BB4	2		1989	
Hypermicroflake	eee	11.0	5.0	1.0	c	n	n	F13	262	BB2	2		1988	
Hypermicroflake	eee	11.0	10.0	1.0	c	n	n	F4	-	AA100			1988	
Hypermicroflake	eee	7.0	8.0	0.5	c	n	n	F7	257	B3	2 top		1988	
Hypermicroflake	eee	6.0	11.0	1.5	f	50%	y	-	141	B2	2 bottom		1987	
Hypermicroflake	eee	9.5	6.0	1.0	f	n	n	F4	439	BB3	2		1989	
Hypermicroflake	eee	8.0	8.0	1.0	f	n	y	-	-	B2			1987	
Hypermicroflake	eee	8.0	12.0	2.0	c	n	n	F4	438	AA4	2		1989	
Hypermicroflake	eee	5.5	5.0	1.0	f	n	y	-	305	AA3	1		1989	
Hypermicroflake	eee	9.0	4.0	1.5	f	n	y	-	411	AA3	2		1989	
Hypermicroflake	eee	6.0	8.5	2.0	f	n	y	-	294	A4	1 bottom		1989	
Hypermicroflake	eee	11.5	9.0	1.0	f	n	y	-	410	AA4	2		1989	
Hypermicroflake	eee	10.0	10.5	2.0	f	n	y	-	378	AA4	2		1989	
Hypermicroflake	eee	12.0	5.0	4.0	c	25%	n	F4	216	D100	2 top		1988	
Hypermicroflake	eee	7.0	6.0	1.0	f	n	n	F1	325	A3	2		1989	
Hypermicroflake	eee	11.0	10.0	2.0	c	50%	n	F4	227	AA99	2		1988	
Hypermicroflake	eee	10.0	8.0	1.0	f	n	y	-	330	AA3	2		1989	
Hypermicroflake	eee	5.0	7.0	0.5	c	n	n	F4	415	AA4	2		1989	
Hypermicroflake	eee	9.0	9.5	2.0	f	n	y	-	135	D1	2C		1987	
Hypermicroflake	eee	7.0	8.0	2.0	f	n	n	F4	223	C100	2		1988	
Hypermicroflake	eee	7.5	2.5	1.5	c	n	n	F7	136	D1	2C		1987	
Hypermicroflake	eee	11.0	6.5	1.0	f	n	n	F2	442	BB4	2		1989	
Hypermicroflake	eee	9.5	6.0	2.0	f	n	y	-	302	AA3	1 bottom		1989	
Hypermicroflake	eee	10.0	8.5	1.0	f	n	n	F13	425	AA4	2		1989	
Hypermicroflake	eee	8.0	8.0	1.0	f	n	n	F13	312	BB3	1 bottom		1989	
Hypermicroflake	eee	12.0	6.0	1.0	c	n	n	F13	428	AA3	2		1989	
Hypermicroflake	eee	7.0	4.0	3.0	f	n	y	-	252	AA2	2		1988	
Hypermicroflake	eee	9.0	5.0	2.0	c	80%	n	F3	334	A3	2		1989	
Hypermicroflake	eee	5.5	5.0	1.5	f	50%	n	F4	360	A4	2		1989	
Hypermicroflake	eee	11.0	12.0	3.0	c	40%	n	F1	326	A3	2		1989	
Hypermicroflake	eee	10.0	9.0	2.0	c	25%	n	F12	122	C2	2	157,293,296,327,328,357,408,B1	1987	24/A
Hypermicroflake	eee	5.0	6.5	1.5	f	n	n	F4	274	BB100	2		1988	

Hypermicroflake	eee	10.5	6.0	1.0	c	100%	n	F9	432	AA4	2		1989	
Hypermicroflake	eee	10.0	5.0	1.0	f	n	y	-	452	BB4	2		1989	
Hypermicroflake	eee	9.5	5.5	1.5	f	n	y	F5	427	AA4	2		1989	
Hypermicroflake	eee	12.0	18.0	7.0	c	n	n	F9	65	B2	2		1987	
Hypermicroflake	eee	5.5	10.0	3.0	f	n	n	F7	-	B1		122,157,293,296,327,328,357,408	1987	24/A
Hypermicroflake	eee	8.5	6.0	1.5	c	n	n	F1	60	B1	2		1987	
Hypermicroflake	eee	6.0	7.0	2.0	c	n	n	F2	-	D1			1987	
Hypermicroflake	eee	8.5	5.5	1.0	c	n	n	F4	-	AA2			1988	
Hypermicroflake	eee	11.0	7.0	1.0	c	n	n	F2	-	C3			1988	
Shatter		7.0	6.0	2.0	f	5%	y	F4	-	C2			1987	
Shatter		6.5	4.5	0.5	c	n	y	-	137	D1	2C		1987	
Shatter		8.5	4.0	0.5	c	n	n	F4	101	C1	2		1987	
Shatter		9.0	5.5	1.0	c	n	y	F4	-	BB4	2		1989	
Shatter		4.0	7.0	1.0	c	n	n	F4	-	BB4	2		1989	
Shatter		6.5	7.0	1.0	c	n	n	F4	81	C1	2		1987	
Shatter		9.0	5.0	1.5	c	n	n	F1	76	A2	2		1987	
Shatter		5.0	3.0	1.5	f	n	y	-	-	B1			1987	
Shatter		6.0	4.0	1.0	c	n	n	F4	-	A2			1987	
Shatter		8.0	5.0	0.5	f	n	y	-	-	B1			1987	
Shatter		6.0	2.5	0.5	c	n	y	-	82	C1	2		1987	
Shatter		8.0	5.0	1.0	f	n	n	F2	-	B1			1987	
Shatter		7.0	5.5	1.5	f	n	y	-	69	B1	2		1987	
Shatter		4.0	7.0	1.0	c	n	n	F7	51	C1	2		1987	
Shatter		2.5	5.5	2.0	f	n	n	F4	-	BB100	2		1988	
Shatter		9.5	5.5	1.0	c	n	y	-	-	B2			1987	
Shatter		6.5	5.0	0.5	f	n	y	-	431	AA3	2		1989	
Shatter		4.0	9.0	0.5	f	n	n	F4	412	AA4	2		1989	
Shatter		11.0	5.0	1.5	c	30%	n	F3	128	C2	2		1987	
Shatter		6.5	3.0	0.5	f	n	n	F3	414	AA3	2		1989	
Shatter		7.0	5.0	0.5	c	n	n	F7	-	B2			1987	
Shatter		7.0	4.0	1.0	c	100%	n	-	-	AA2			1988	
Shatter		10.0	8.5	0.5	c	10%	n	F1	-	A1			1989	
Shatter		3.5	2.0	0.5	c	n	n	F2	369	AA4	2		1989	
Shatter		7.0	5.0	1.0	c	n	n	F4	-	A1			1989	
Shatter		6.0	6.0	1.0	c	n	n	F1	256	B3	2 top		1988	

Artefact	Typology (Laplace, 1964)	Length	Width	Thickness	Condition	Cortex	Fire	Flint Group	Number	Square	Layer	Refitting	Year	Figure
Shatter		6.0	4.0	0.5	c	n	n	F2	98	B2	2		1987	
Shatter		7.0	3.0	1.5	c	n	n	F4	212	C100	2		1988	
Shatter		4.0	6.0	1.0	f	n	n	F4	-	A1	1		1987	
Shatter		8.5	3.0	2.0	c	n	y	-	376	A3	2		1989	
Shatter		4.5	6.0	0.5	c	n	n	F4	8	A1	1 bottom		1987	
Shatter		5.0	4.5	0.5	f	n	n	F13	424	AA3	2		1989	
Shatter		5.0	5.0	1.0	c	n	n	F3	379	AA3	2		1989	
Shatter		6.0	3.5	2.0	f	n	y	-	440	BB3	2		1989	
Shatter		6.5	1.5	1.0	c	n	y	-	398	AA3	2		1989	
Shatter		5.0	6.0	0.5	c	n	n	F3	363	AA4	2		1989	
Shatter		6.0	4.0	0.5	f	n	y	-	430	BB3	2		1989	
Shatter		5.0	6.0	1.5	c	10%	n	F4	382	AA4	2		1989	
Shatter		8.0	4.0	0.5	c	n	n	F7	-	A2			1987	
Shatter		6.0	10.0	1.5	c	n	n	F7	388	AA3	2		1989	
Shatter		8.0	3.0	2.0	c	n	y	-	-	AA3	2		1989	
Shatter		7.0	5.5	1.0	f	n	y	-	444	BB4	2		1989	
Shatter		4.5	5.5	1.0	c	n	y	-	56	B1	2		1987	
Shatter		7.0	5.5	1.0	c	n	n	F1	121	C2	2		1987	
Shatter		5.0	5.0	2.0	f	n	y	-	416	AA3	2		1989	
Shatter		8.0	5.0	3.0	f	n	y	-	387	AA3	2		1989	
Shatter		5.0	5.0	0.5	c	n	n	F1	368	AA4	2		1989	
Shatter		4.0	7.0	0.5	f	n	y	-	420	AA3	2		1989	
Shatter		5.5	7.0	1.0	f	n	n	F3	97	B2	2		1987	
Shatter		6.0	5.0	1.0	c	n	y	F4	-	A2			1987	
Shatter		5.0	3.0	0.5	c	n	n	F13	426	AA4	2		1989	
Shatter		4.0	7.0	1.5	f	n	y	-	-	C1			1987	
Shatter		4.5	3.0	1.0	c	n	n	F7	52	C1	2		1987	
Shatter		4.5	4.5	0.5	c	100%	n	-	311	AA4	1 bottom		1989	
Shatter		5.0	4.0	0.5	c	n	n	F4	336	AA4	2		1989	
Shatter		7.0	3.0	0.5	c	n	y	F7	174	D1	2C		1987	
Shatter		9.5	5.0	1.0	c	n	n	F2	-	C100			1988	
Shatter		5.0	4.0	0.5	c	n	y	-	400	AA4	2		1989	

Appendix 3 – AN ARCHAEOMAGNETIC STUDY (I.H.)

Two hearths at the Mesolithic site of Laghetti del Crestoso have been sampled with the aim of carrying out an archaeomagnetic study. These were Structure 1 (square D100) and Structure 5 (at the junction of squares A-AA/99-100) (figs. 7 and 11).

The technique used for taking the archaeomagnetic samples consisted of glueing thin polycarbonate discs (diameter 25 mm) on the horizontal surface of the burnt soil with instant glue.

The horizontal surface of each disc was checked with a «bulls-eye» spirit level before the glue set and then a north pointing orientation arrow was traced on the disc's top surface. The direction of this arrow was controlled using a sun compass. The oriented samples were then cut free from the hearth using a non-magnetic bronze tool.

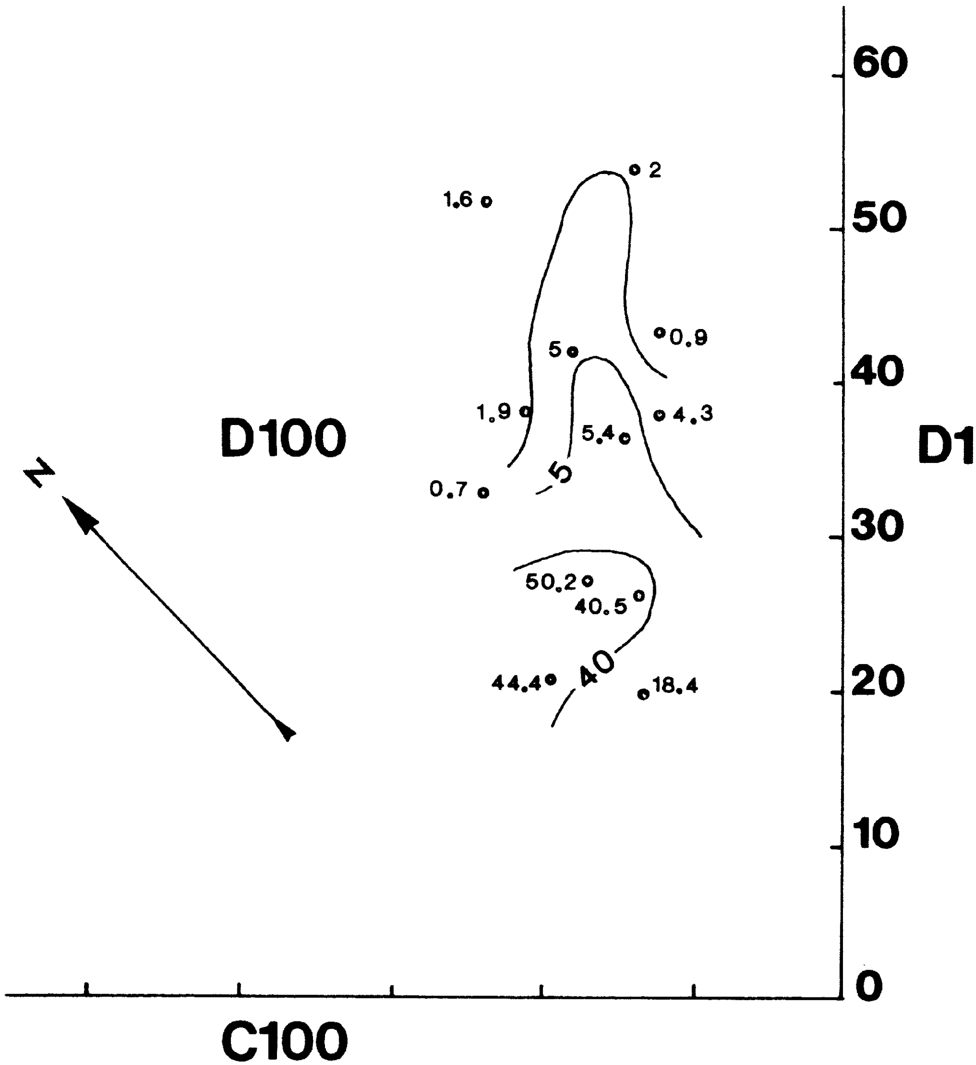

Fig. 49 – Laghetti del Crestoso: Structure 1 (fireplace). Specific natural remanent magnetisation [10^{-6} $Am^2 kg^{-1}$ or G $cm^3 g^{-1}$] (*drawn by I. Hedley*).

The natural remanent magnetisation (NRM) of the samples was measured in the laboratory using a «Minispin» fluxgate magnetometer. The directions of the NRM of the samples from both hearths exhibit large dispersions. The mean directions are:
Structure 1: Declination=12.3°, Inclination=69.1°, $\alpha 95$ =30.4°, n=13
Structure 5: Declination=2.7°, Inclination=61.6°, $\alpha 95$ =27.3°, n=12.
The semi-angles ($\alpha 95$) of the Fisherian cone of confidence for each hearth are large and this raises serious doubts as to the magnetic reliability of the hearths.
The magnetic viscosity or instability of the samples, as measured by a laboratory storage for 2 months in a reversed position in the hearths magnetic field, is considerable with values of up to 70%. This result combined with the large dispersion in directions of NRM would suggest that the archaeomagnetic results are not significant.
In general all samples have much lower intensities of NRM than one would expect from a burnt structure.
The values are highly variable varying for example from 50 to 1×10^{-6} (G cm^3 9^{-1} or Am^2 kg^{-1}) for Structure 1. Such low values are not probably due to a low heating temperature (100-200°C) of the material sampled although the low iron oxide content of the sandy soil could also play a role.
Partial heating as well as a physical disturbance of the fragile hearths after their abandon are the most probable explanation of the poor archaeomagnetic results.
The only aspect of the present study is that the highly variable intensity of NRM enables one to locate the centre of the Structure 1 (fig. 49).

RIASSUNTO (P.B. e E.S.)

Scavi nella stazione mesolitica d'alta quota dei Laghetti del Crestoso (Bovegno, Brescia)

L'accampamento Castelnoviano dei Laghetti del Crestoso venne scoperto nel Settembre del 1994 lungo la sponda settentrionale dell'invaso più basso, ad una quota di 2006 metri. I due laghetti si trovano racchiusi, a nord, dal Monte Colombino (m 2135), a sud dal Monte Crestoso (m 2207).

Gli scavi, promossi e finanziati dal Museo Civico di Scienze Naturali di Brescia, vennero condotti in tre momenti successivi, fra il 1987 ed il 1989, dopo che in una campagna preliminare di prospezioni archeologiche ed archeobotaniche erano stati eseguiti dei carotaggi palinologici nel punto più profondo del bacino inferiore.

Le ricerche nell'accampamento Mesolitico hanno posto in luce un'interessante stratigrafia ed una serie di strutture archeologiche comprendenti focolari, pozzetti e possibili buche di palo. La serie archeologica era sigillata da un deposito di torba, il cui orizzonte più basso è stato datato a 1960±60 BP (HAR-8872). Alcune delle struttura archeologiche, ricche di resti carboniosi, sono state anch'esse datate con il metodo del ^{14}C ed hanno restituito i seguenti risultati: focolare 1: 6790±120 BP (HAR-8871); pozzetto 9: 7870±50 BP (GrN-21889); pozzetto 10: 6870±70 BP (GrN-18091) e 7850±80 BP (Beta-35241).

I reperti della cultura materiale portati alla luce riguardano principalmente un'industria su selce scheggiata che è stata analizzata con particolare attenzione non solo per quanto concerne la tipologia dei reperti litici, ma anche la provenienza della materia prima, la distribuzione areale dei manufatti all'interno dell'accampamento e la funzione dei medesimi per mezzo dell'analisi traceologica.

Per quanto attiene alla tipologia degli oggetti, si è notata la presenza di un'industria particolarmente specializzata, composta quasi esclusivamente di armature trapezoidali e dai residui di lavorazione di questi strumenti (microbulini). Nell'insieme dei reperti figurano anche prenuclei e nuclei subconici a lamelle, un grattatoio, troncature, lame e pochi altri oggetti ritoccati.

Per quanto riguarda la provenienza della materia prima, sono stati distinti 17 tipi di selce in base alle loro caratteristiche macroscopiche, vale a dire colore, tessitura, grado di trasparenza, aspetto del cortice. Quest'ultimo in particolare indica lo sfruttamento della materia prima principalmente sotto forma di noduli, probabilmente raccolti in depositi secondari. I tipi di selce presenti nel sito dei Laghetti del Crestoso si possono riferire ad almeno tre zone di affioramento conosciute, vale a dire il Monte Alto, a sud ovest del Lago d'Iseo, le colline calcaree della Franciacorta ed infine i Monti Lessini e/o le morene orientali del Lago di Garda. La maggior parte dei manufatti rinvenuti ai Laghetti del Crestoso è scheggiata utilizzando la selce opaca del Monte Alto, mentre solo alcuni reperti sono ottenuti da selci i cui affioramenti non sono ancora conosciuti. Questi manufatti, in assenza di *débitage* riferibile alla loro produzione, dimostrano l'introduzione nell'accampamento di oggetti già pronti all'uso, preparati altrove.

L'industria litica è stata sottoposta al metodo del «*refitting*», ovvero al rimontaggio dei pezzi per ricostruire il sistema di produzione; i risultati sono stati analizzati dal punto di vista della distribuzione spaziale, allo scopo di identificare zone di attività specializzata all'interno dell'area dell'accampamento scavata.

Sono state in questo modo riconosciute delle sequenze relative alla produzione primaria, consistente nella scheggiatura di lamelle e nel loro utilizzo per la preparazione di armature geometriche. Altri rimontaggi riguardano sequenze di schegge di decorticazione e preparazione dei nuclei e, infine, un certo numero di manufatti fratturati. Mancano i «*refittings*» relativi alla modificazione dei supporti e alla preparazione o al ravvivamento degli strumenti (ritocco, ecc.); questo indica che la scheggiatura era finalizzata soprattutto alla preparazione di armature, come testimoniato dagli abbondanti residui rinvenuti (microbulini), il cui utilizzo avveniva però fuori dall'accampamento.

Sia il rimontaggio dei manufatti che la loro distribuzione spaziale secondo i tipi di selce, sembrano isolare due distinti complessi, uno rappresentato da *clusters* di manufatti attorno a determinate strutture ed un'altro che mostra una dispersione maggiore: il complesso più sparso, e quindi disturbato, contiene anche determinati tipi di strumenti, come trapezi isosceli a troncature completamente ritoccate, piccoli microbulini ed un triangolo, mentre il secondo complesso è caratterizzato principalmente da trapezi a *piquant trièdre* e microbulini più grandi. Questi due insiemi sono probabilmente da riferire a due occupazioni del medesimo sito, avvenute in due momenti diversi. Questa osservazione concorda sia con i dati desunti dalla colonna pollinica, in cui sono stati individuati due distinti orizzonti a carboni correlabili ad altrettante frequentazioni antropiche, sia con le datazioni radiometriche ottenute.

L'analisi pollinica dei depositi inglobati nell'invaso ora intorbato ha permesso di seguire l'evoluzione della copertura arborea del territorio circostante il bacino dalla fine del Tardiglaciale ai giorni nostri, oltre che di ricostruire l'ambiente vegetazionale del periodo climatico Atlantico durante i momenti di occupazione del sito. Per favorire questi risultati, la sequenza pollinica è stata radiodatata, col il metodo del ^{14}C, in sei punti ben definiti della colonna, prelevata sino ad una profondità massima di m 3,20.

L'analisi palinologica è stata inoltre integrata da quella antracologica, condotta sui campioni di carbone vegetale raccolti nelle varie strutture d'abitato. Da quest'ultimo studio è risultato che l'Abete rosso era la specie arborea più impiegata dai cacciatori mesolitici del Crestoso per accendere i loro fuochi, seguita dal Pino silvestre e dal Larice. I rami di queste essenze arboree venivano raccolti in vicinanza dell'accampamento, che doveva sorgere al limite altitudinale della foresta, dove questa si diradava per dare luogo alla prateria alpina.

Lo studio analitico dei due momenti di insediamento Castelnoviano riconosciuti lungo la sponda settentrionale del laghetto basso del Crestoso ha permesso di interpretare alcuni aspetti della vita di due distinte comunità degli ultimi cacciatori-raccoglitori dell'Atlantico che scelsero come base momentanea questa località, prima all'inizio dell'VIII e poi all'inizio del VII millennio BP, nei pressi dello spartiacque che separa l'alta Val Trompia dalla media Val Camonica; spartiacque lungo il quale le tracce di antropizzazione preistorica e storica sono molto numerose, come indicano i ritrovamenti e gli studi degli ultimi venti anni di ricerche.

REFERENCES

Accorsi, C.A., Bandini Mazzanti, M., Biagi, P., Castelletti, L., Cremaschi, M., Leoni, L. and Pavarani, M. 1987 – *Il sito Mesolitico sopra Fienile Rossino sull'Altipiano di Cariàdeghe (Serle, Brescia). Aspetti pedostratigrafici, archeologici, antracologici e palinologici.* Natura Bresciana, 23: 239-292.

A.F.E.S. (Association Française pour l'Etude du Sol) 1992 – *Referentiel Pedologique. Principaux sols d'Europe.* INRA, Paris.

Alessio, M., Allegri, L., Bella, F., Broglio, A., Calderoni, G., Cortesi, C., Improta, S., Preite Martinez, M., Petrone, V. and Turi, B. 1983 – *^{14}C datings of three Mesolithic series of Trento Basin in the Adige Valley (Vatte di Zambana, Pradestel, Romagnano) and comparisons with the mesolithic series of other regions.* Preistoria Alpina, 19: 245-254.

Alessio, M., Angelucci, D.E., Broglio, A. and Improta, S. 1994 – *New data for the chronology of the Mesolithic in the Dolomites. The radiocarbon dates from Plan de Frea (Selva Val Gardena, Italy).* Preistoria Alpina, 30: 145-154.

Andreolotti, S. and Gerdol, R. 1973 – *L'Epipaleolitico della Grotta Benussi (Carso Triestino).* Atti e Memorie della Commissione Grotte E. Boegan, IX: 59-103.

Angelucci, D., Cremaschi, M., Negrino, F. and Pelfini, M. 1992 – *Il sito mesolitico di Dosso Gavia – Val Gavia (Sondrio-Italia): evoluzione ambientale e popolamento umano durante l'Olocene antico nelle Alpi centrali.* Preistoria Alpina, 28 (1): 19-32.

Bagolini, B. 1968 – *Ricerche sulle dimensioni dei manufatti litici preistorici non ritoccati.* Annali dell'Università di Ferrara. Sezione XV, Paleontologia Umana e Paletnologia, 1 (10): 196-219.

Bagolini, B. and Nisi, D. 1976 – *Fontana de la Teia (Monte Baldo – Verona).* Preistoria Alpina, 12: 243-244.

Bagolini, B., Nisi, D. and Tonelli, L. 1978 – *Malga dell'Alpe – Passo Gavia (Sondrio).* Preistoria Alpina, 14: 275.

Barfield, L.H. 1994 – *The exploitation of flint in the Monti Lessini, northern Italy.* In Ashton, N. and David, A. (eds.) *Stories in Stone.* Lithic Studies Society Occasional Paper, 4: 71-86. London.

Baroni, C., Biagi, P., Nisbet, R. and Scaife, R.G. 1987 – *Bovegno (Brescia), Laghetti del Crestoso.* Soprintendenza Archeologica della Lombardia, Notiziario 1987: 15-17.

Baroni, C., Biagi, P., Nisbet, R. and Scaife, R.G. 1990 – *Laghetti del Crestoso: a high altitude Castelnovian camp in its environmental setting.* In Biagi, P. (ed.) *The Neolithisation of the Alpine Region.* Monografie di Natura Bresciana, 13: 43-51. Brescia.

Bertoldi, R. 1968 – *Ricerche polliniche sullo sviluppo della vegetazione tardiglaciale e postglaciale nella regione del Lago di Garda.* Studi Trentini di Scienze Naturali, Serie B, 45 (1): 87-162.

Bertoldi, R. 1980 – *Le vicende vegetazionali e climatiche nella sequenza paleobotanica würmiana e post-würmiana di Lagdei (Appennino settentrionale).* Ateneo Parmense, Acta Naturalia, 16: 147-175.

Bertoldi, R. and Consolini, M. 1989 – *Deglaciazione e sviluppo vegetazionale tardi-postglaciale nella regione del Lago d'Iseo attraverso analisi polliniche e datazione ^{14}C.* Memorie della Società Geologica Italiana, 42: 139-145.

Biagi, P. 1976 – *Ricerche nelle Torbiere d'Iseo (Brescia). IV. Stazione Mesolitica a Provaglio d'Iseo.* Natura Bresciana, 13: 75-92.

Biagi, P. 1983 – *Segnalazione di industria mesolitica a trapezi dal Riparo 2 di Foppe di Nadro in Valcamonica.* Bollettino del Centro Camuno di Studi Preistorici, 20: 117-119.

Biagi, P. 1995 – *Il Mesolitico in Provincia di Brescia: ricerche e scavi lungo lo spartiacque Val Sabbia-Val Trompia-Val Camonica.* Commentari dell'Ateneo di Brescia per il 1993: 29-50.

Biagi, P. 1996 – *North eastern Italy in the Seventh Millennium BP: a Bridge between the Balkans and the West?* In Draşovean, F. (ed.) *The Vinča Culture, its Role and Cultural Connections.* Biblioteca Historica et Archaeologica Banatica, 2: 9-22. Mirton, Timişoara.

Biagi, P. 1997a – *Risultati preliminari delle recenti ricerche sul Mesolitico della Valle Camonica.* Bollettino del Centro Camuno di Studi Preistorici, 30 (in press).

Biagi, P. 1997b – *Some Aspects of the Late Mesolithic and Early Neolithic periods in Northern Italy.* In Kértesz, R. and Makkay, J. (eds.) *At the Fringes of Three Worlds.* Szolnok (in press).

Biagi, P., Nisbet, R. and Scaife, R. 1994a – *Man and Vegetation in the Southern Alps: the Valcamonica-Valtrompia-Valsabbia watershed (northern Italy).* In Biagi, P. and Nandris, J. (eds.) *Highland Zone Exploitation in Southern Europe.* Monografie di Natura Bresciana, 20: 133-142. Brescia.

Biagi, P., Nisbet, R. and Scaife, R. 1994b – *Hunter-foragers Subsistence and Settlement in a Southern Alpine Watershed.* Poročilo o raziskovanju paleolitika, neolitika in eneolitika v Sloveniji, XXII: 219-232.

BINFORD, L.R. 1982 – *The Archaeology of Place*. Journal of Anthropological Archaeology, 1 (1): 5-31.

BONI, A., ARDIGÒ, G., CASSINIS, G., CAVALLARO, E., CERRO, A., FUGAZZA, F., ROSSETTI, R. and ZEZZA, F. 1972 – *Carta Geologica delle Prealpi Bresciane a Sud dell'Adamello*. Atti dell'Istituto di Geologia dell'Università di Pavia, 22 (2 maps at 1:50.000).

BONI, A. and CASSINIS, G. 1973 – *Carta Geologica delle Prealpi Bresciane a Sud dell'Adamello. Note illustrative della legenda stratigrafica*. Atti dell'Istituto di Geologia dell'Università di Pavia, 23: 119-157.

BROGLIO, A. and KOLZLOWSKI, S.K. 1983 – *Tipologia ed evoluzione delle industrie mesolitiche di Romagnano III*. Preistoria Alpina, 19: 93-148.

BROGLIO, A. and LANZINGER, M. 1990 – *Considerazioni sulla distribuzione dei siti tra la fine del Paleolitico Superiore e l'inizio del Neolitico nell'Italia nord-orientale*. In BIAGI, P. (ed.) *The Neolithisation of the Alpine Region*. Monografie di Natura Bresciana, 13: 53-69. Brescia.

BULLOCK, P., FEDOROFF, N., JONGERIUS, A., STOOPS, G. and TURSINA, T. 1985 – *Handbook for soil thin section description*. Waine Research Publisher, Wolverhampton.

CAHEN, D. 1987 – *Refitting stone artefacts: why bother?* In SIEVEKING, G. de G. and NEWCOMER, M.H. (eds.) *The human uses of flint and chert*: 1-9. Cambridge University Press, Cambridge.

CANNARELLA, D. 1984 – *La storia delle ricerche del Mesolitico del Carso Triestino*. In *Il Mesolitico sul Carso Triestino*. Società per la Preistoria e Protostoria della regione Friuli-Venezia Giulia. Quaderno, 5: 13-20.

CASSINIS, G., GIOBBI, E., NERI, C. and ORI, G. 1986 – *The continental Permian south of the Adamello Massif. Excursion 7*. In SOCIETÀ GEOLOGICA ITALIANA – IGCP *Permian and Permian-Triassic boundary in the South-Alpine segment of the western Tethys* (July 4-12, 1986). Excursion guidebook.

CASTELLETTI, L., CREMASCHI, M. and NOTINI, P. 1976 – *L'insediamento mesolitico di Lama Lite sull'Appennino Tosco-Emiliano (Reggio Emilia)*. Preistoria Alpina, 12: 7-32.

CASTELLETTI, L., MASPERO, A. and TOZZI, C. 1994 – *Il popolamento della Valle del Serchio (Toscana settentrionale) durante il Tardiglaciale Würmiaano e l'Olocene antico*. In BIAGI, P. and NANDRIS, J. (eds.) *Highland Zone Exploitation in Southern Europe*. Monografie di Natura Bresciana, 20: 189-204. Brescia.

CICCONE, A. 1993 – *L'industria mesolitica della Grotta Azzurra di Samatorza: scavi 1982*. Atti della Società per la Preistoria e Protostoria della Regione Friuli-Venezia Giulia, VII: 13-64.

COHMAP MEMBERS 1988 – *Climatic changes of the last 18,000 years: observations and model simulations*. Science, 241: 1043-1052.

CREMASCHI, M. and CASTELLETTI, L. 1975 – *Deposito mesolitico del Passo della Comunella (Reggio E.), Appennino Tosco-Emiliano*. Preistoria Alpina, 11: 133-154.

CREMONESI, G., PITTI, C. and RADMILLI, A.M. 1984 – *Considerazioni sul Mesolitico del Carso Triestino*. In *Il Mesolitico sul Carso Triestino*. Società per la Preistoria e la Protostoria della Regione Friuli-Venezia Giulia. Quaderno, 5: 229-240.

CRUISE, G.M. 1990a – *Holocene peat initiation in the Ligurian Appenines, northern Italy*. Review of Palaeobotany and Palynology, 63: 173-182.

CRUISE, G.M. 1990b – *Pollen stratigraphy of two Holocene peat sites in the Ligurian Appenines, northern Italy*. Review of Palaeobotany and Palynology, 63: 299-313.

CZIESLA, E. 1990a – *On refitting of stone artefacts*. In CZIESLA, E., EICKHOFF, S., ARTS, N. and WINTER, D. (eds.) *The Big Puzzle*. Studies in Modern Archaeology, 1: 9-44. Bonn.

CZIESLA, E. 1990b – *Artefact production and spatial distribution on the open air site 80/14 (Western Desert, Egipt)*. In CZIESLA, E., EICKHOFF, S., ARTS, N. and WINTER, D. (eds.) *The Big Puzzle*. Studies in Modern Archaeology, 1: 583-610. Bonn.

D'ALESSIO, D. and PREVITALI, F. 1988 – *I podzoli della Valle Camonica (Alpi meridionali bresciane)*. Natura Bresciana, 24: 47-73.

DALLA FIOR, G. 1932 – *Analisi polliniche di torbe e depositi lacustri della Venezia Tridentina*. Memorie del Museo di Storia Naturale della Venezia Tridentina, 1 (3-4): 139-166.

DALLA FIOR, G. 1933 – *Torbe del Renon*. Memorie del Museo di Storia Naturale della Venezia Tridentina, 1 (5): 235-249.

DALLA FIOR, G. 1969 – *Analisi polliniche di torbe e depositi lacustri della Venezia Tridentina*. Studi Trentini di Scienze Naturali, Sezione B, XLVI (1): 1-158.

DE BEAULIEU, J.L., PONS, A. and REILLE, M. 1982 – *Recherches pollenanalytiques sur l'histoire de la vegetation de la bordure nord du Massif du Cantal (Massif Central, France)*. Pollen et Spores, 24(2): 251-300.

F.A.O.-U.N.E.S.C.O. 1985 – *Soil map of the world. Revised legend*. Third draft. Rome.

F.A.O.-U.N.E.S.C.O. 1990 – *Soil map of the world. Revised legend*. Final draft. Rome.

FAPPANI, A. 1983 – *Berzo: S. Glisente*. In *Santuari nel Bresciano. 4 Valle Camonica - II*: 93-104. Edizioni La Voce del

Popolo, Brescia.
FEDELE, F. 1992 – *Steinzeitliche Jäger in den Zentralalpen: Piano dei Cavalli (Splügenpass).* Helvetia Archaeologica, 89: 2-22.
FEDELE, F., BUZZETTI, M., CAMPAJOLA, L., MOTTURA, A., ROCA, V., ROMOLI, M., TERRASI, F. and WICK, L. 1992 – *Preistoria e paleoambienti della Valchiavenna: ricerche 1992.* Clavenna, XXXI: 35-112.
FISCHER, A., GRØNNOW, B., JØNSSON, J.-H., NIELSON, F.-O. and PETERSEN, C. 1979 – *Stenalder-Eksperimenter i Lejre. Bopladsernes indretning.* Working Papers, 8. The National Museum of Denmark, København.
FISCHER, A., HANSEN, P.V. and RASMUSSEN, P. 1984 – *Macro and micro-wear traces on lithic projectile points.* Journal of Danish Archaeology, 3: 19-46.
HAYDEN, B. 1979 – *The Ho-Ho classification and nomenclature committee report.* In HAYDEN, B. (ed.) *Lithic use-wear analysis*: 133-135. Academic Press, London.
HOROWITZ, A. 1975 – *Holocene pollen diagrams and palaeoenvironments of Valcamonica, northern Italy.* Bollettino del Centro Camuno di Studi Preistorici, 12: 39-48.
JALUT, G., DELIBRIAS, G., DAGNAC, J., MARDONES, M. and BOUHOURS, M. 1982 – *A palaeoecological approach to the last 21,000 years in the Pyrenees: the peat bog of Freychinede (alt. 1350 m, Ariege, south France).* Palaeogeography, Palaeoclimatology, Palaeoecology, 40: 321-359.
JALUT, G., ESTEBAN AMAT, A., PAGES, P. and MARDONES, M. 1984 – *Quelques aspects de l'action de l'homme sur le milieu montagnard Pyreneen: consequences phytogeographiques.* Ecologie des Milieux Moutagnards et de haute Altitude. Documents d'Ecologie Pyreneenne, III-IV: 503-509.
KEELEY, L.H. 1980 – *Experimental determination of stone tool uses.* University of Chicago Press, Chicago.
KELLER, P. 1931 – *Die postglaziale entwicklungsgeschichte der Walder von Norditalien.* Veröffentlichungen des Geobotanischen Institutes Rübel in Zürich, 9: 1-187.
KRAL, F. 1972 – *Grundlagen zur Entstehung der Waldgesellschaften im Ostalpenraum.* Berichte des Deutschen Botanischen Gesellschaf, 85: 173-186.
LANZINGER, M. 1986 – *Ricerche nei siti mesolitici della Cresta di Siusi (Auf der Schneide, siti XV e XVI dell'Alpe di Siusi) nelle Dolomiti. Considerazioni sul significato funzionale espresso dalle industrie mesolitiche della regione.* Preistoria Alpina, 21: 3-48.
LAPLACE, G. 1964 – *Essay de typologie sistématique.* Annali dell'Università di Ferrara. Sezione XV, Paleontologia Umana e Paletnologia. Supplemento II al volume I.
LAWRENCE, R.A. 1979 – *Experimental evidence for the significance of attributes used in edge-damage analysis.* In HAYDEN, B. (ed.) *Lithic use-wear analysis*: 113-121. Academic Press, London.
LEMORINI, C. 1990 – *Osservazione delle tracce d'uso su di un campione dell'industria mesolitica di Sopra Fienile Rossino (Serle, Brescia).* Natura Bresciana, 25: 319-328.
LEVI SALA, I. 1986 – *Use-wear and post-depositional surface modification: a word of caution.* Journal of Archaeological Science, 13: 229-244.
LOWE, J.J. 1992 – *Lateglacial and early Holocene lake sediments from the northern Apennines, Italy. Pollen stratigraphy and radiocarbon dating.* Boreas, 21: 193-208.
MANGERUD, J., ANDERSEN, S.T., BERKLUND, B.E. and DONNER, J.J. 1974 – *Quaternary stratigraphy of Norden, a proposal for terminology and classification.* Boreas, 3: 109-127.
MARKGRAF, V. 1970 – *Palaeohistory of the spruce in Switzerland.* Nature, 228: 249-251.
MARTINI, F. and SARTI, L. 1983 – *Indagine su alcune industrie litiche mesolitiche dell'Italia settentrionale mediante la «Cluster analysis».* Preistoria Alpina, 19: 225-234.
MOORE, P.D., WEBB, J.A. and COLLISON, M.E. 1991 – *Pollen analysis.* Second Edition. Blackwell Scientific Publications, Oxford.
MOSS, E.H. 1983 – *The functional analysis of flint implements. Pincevent and Pont d'Ambon: two case studies from the French Final Palaeolithic.* British Archaeological Reports. International Series, 177. Oxford.
MOSS, E.H. and NEWCOMER, M.H. 1982 – *Reconstruction of tool use at Pincevent: microwear and experiments.* In CAHEN, D. (ed.) *Tailler! Pour Quoi Faire: Préhistoire et Technologie Lithique II. Recent Progress on Microwear Studies.* Musée Royal de l'Afrique Centrale: 289-313.
MUNSELL, 1992 – *Munsell Soil Color Charts.* Macbeth Division of Kollmorgen Instruments Corporation. Newburgh, New York.
ODELL, G.H. and COWEN, F. 1986 – *Experiments with spears and arrows on animal target.* Journal of Field Archaeology, 13: 195-212.
PELLEGATTI, P. 1992-93 – *Il sito Mesolitico di Provaglio d'Iseo (Brescia) nel suo contesto paleoambientale.* Tesi di Laurea discussa all'Università Cà Foscari di Venezia. Facoltà di Lettere e Filosofia.
PLISSON, H. 1985 – *Etude functionelle d'outillages lithiques préhistoriques par l'analyse des microusures.* Thèse de 3e

cycle, Université de Paris I.
PLISSON, H. 1986 – *Alteration des micropolis d'usage: quelques experiences complémentaires.* In OWEN, L. and UNRATH, G. (eds.) Early Man News, 9/10/11: 11-116. Tübingen.
POGGIANI KELLER, R. 1995 – *Museo Archeologico della Valle Camonica (Cividate Camuno, Brescia).* In ASPES, A. (ed.) *Italia padana e centro-alpina.* Guide Archeologiche. Preistoria e Protostoria in Italia, 5: 195-201. A.B.A.C.O., Forlì.
PONEL, P. and LOWE, J.J. 1992 – *Coleopteran, pollen and radiocarbon evidence from the Prato Spilla «D» succession, N. Italy.* Comptes Rendues de l'Academie des Sciences de Paris, 315, Series II: 1425-1431.
PREVITALI, F., D'ALESSIO, D., GALLI, A. and TOSI, L. 1992 – *I suoli, i paesaggi fisici, il dissesto idrogeologico in Val Camonica e in Val di Scalve (Alpi meridionali).* Monografie di Natura Bresciana, 17. Brescia.
SCAIFE, R.G. 1991 – *Pastoralism and the upper montane tree limit of the Italian Alps.* Rivista di Studi Liguri, LVII (1-4): 195-211.
SCAIFE, R. and BIAGI, P. 1994 – *Pollen analysis of the Rondeneto Mesolithic site and dating of peat accumulations in the Valcamonica region (northern Italy).* In BIAGI, P. and NANDRIS, J. (eds.) *Highland Zone Exploitation in Southern Europe.* Monografie di Natura Bresciana, 20: 143-152. Brescia.
SCHNEIDER, R. 1978 – *Pollenanalytische Untersuchungen zur Kenntnis der spät- und postglazialen Vegetationsgeschichte am Sudrand der Alpen zwischen Turin und Varese (Italien).* Botanische Jahrbuch Systematische, 100: 26-109.
SCHNEIDER, R. 1985 – *Palynologic research in the southern and southeastern Alps between Torino and Trieste. A review of investigations concerning the last 15,000 years.* Dissertationes Botanicae, 87: 83-106.
SCHNEIDER, R. and TOBOLSKI, K. 1985 – *Lago di Ganna. Late-glacial and Holocene environments of a lake in the southern Alps.* Dissertationes Botanicae, 87: 229-271.
SIMMONS, I.G. 1969 – *Environment and early man on Dartmoor.* Proceedings of the Prehistoric Society, 35: 203-219.
SIMMONS, I.G. 1975 – *Towards an ecology of Mesolithic man in the uplands of Great Britain.* Journal of Archaeological Science, 2: 1-15.
SINA, A. 1944 – *La leggenda di Carlo Magno e il culto di S. Glisente in Valle Camonica.* Memorie Storiche della Diocesi di Brescia, XII: 99-151.
SOIL SURVEY STAFF 1975 – *Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys.* USDA-SCS Agriculture Handbook. US Government Printing Office, Washington.
SOLOMON, A.M. and SILKWORTH, A.B. 1986 – *Spatial patterns of atmospheric transport in a montane region.* Quaternary Research, 25: 150-162.
TALLANTIRE, P.A. 1973 – *Apropos the post-glacial spread of spruce in Switzerland.* Grana, 13: 79-84.
TRINGHAM, R., COOPER, G., ODELL, G., VOYTEK, B. and WHITMAN, A. 1974 – *Experimentation in the formation of edge damage: a new approach to lithic analysis.* Journal of Field Archaeology, 1: 171-196.
UNRATH, G., OWEN, L.R., VAN GIJN, A., MOSS, E.H., PLISSON, H. and VAUGHAN, P. 1986 – *An evaluation of use-wear studies: a multi-analyst approach.* In OWEN, L. and UNRATH, G. (eds.) Early Man News, 9/10/11: 117-176. Tübingen.
VALLA, F. and LECHEVALLIER, M. 1989 – *Notes à propos de quelques foyers Natoufiens de Mallaha (Eynan, Israël).* In OLIVE, M. and TABORIN, Y. (eds.) *Nature et fonction des foyers préhistoriques.* Actes du Colloque de Nemours. Mémoires du Musée de Préhistoire d'Ile de France, 2: 293-302.
VIKKULA, A. 1993 – *The pit hearth of the Tyttöpuisto type – a non reusable fireplace.* Fennoscandia Archaeologica, X: 19-30.
VON POST, L. 1916 – *Om skogstradspollen i sydenska torfmosselagerfoljder (foredragsreferat).* Geologiska Föreningens i Stockholm Förhandlingar, 38: 384-394.
WANG, Y. and AMUNDSON, R. 1996 – *Radiocarbon Dating of Soil Organic Matter.* Quaternary Research, 45 (3): 282-288.
WELTEN, M. 1982 – *Pollenanalytische Untersuchungen zur Vegetationsgeschichte des Schweizerischen Nationalparks.* Ergebnisse der Wissenschaftlichen Untersuchungen der Schweizerischen Nationalpark, 16: 1-43.
WICK, L. 1994 – *Vegetation development and human impact at the forest limit: palaeoecological studies in the Splügen Pass area (northern Italy).* In BIAGI, P. and NANDRIS, J. (eds.) *Highland Zone Exploitation in Southern Europe.* Monografie di Natura Bresciana, 20: 123-132. Brescia.
WINTER, D. 1990 – *«The refitters failure» – Some criteria concerning the duration of settlement through refitting.* In CZIESLA, E., EICKHOFF, S., ARTS, N. and WINTER, D. (eds.) *The Big Puzzle.* Studies in Modern Archaeology, 1: 477-492. Bonn.
ZOLLER, H. 1958 – *Pollenanalytische Untersuchungen im unteren Misox mit den ersten Radiocarbon-Datierungen in der Südschweiz.* IV INQUA 1957. Veröffentlichungen des Geobotanischen Institutes Rübel in Zürich, 34: 166-176.
ZOLLER, H. 1960 – *Die wärmezeitliche Verbeitung von Haselstrauch, Eichenmischwald, Fichte und Weisstanne in den Alpenländern.* Bauhinia, 1: 189-207.

Authors' Address:

CARLO BARONI, Dipartimento di Scienze della Terra, Università di Pisa & CNR, Centro di Studio per la Geologia Strutturale e Dinamica dell'Appennino, Via S. Maria 53 – I-56126 PISA

PAOLO BIAGI, Dipartimento di Scienze dell'Antichità e del Vicino Oriente, Sezione di Archeologia, Università Cà Foscari di Venezia, Palazzo Bernardo, S. Polo 1977 – I-30125 VENEZIA

IAN HEDLEY, Départemen de Minéralogie de l'Université, 13 rue des Maraichers – CH-1211 GENÉVE 4

CRISTINA LEMORINI, Dipartimento di Biologia Animale e dell'Uomo, Università di Roma «La Sapienza», Piazzale Aldo Moro 5 – I-00185 ROMA

RENATO NISBET, Viale Rimembranza 7 – I-10066 TORRE PELLICE (TO)

CATERINA OTTOMANO, Geoarcheologia snc, Via Abbadesse 48 – I-20128 MILANO

ROB SCAIFE, Department of Geography, University of Southampton, Highfield, GB-SOUTHAMPTON SO17 1BJ

ELISABETTA STARNINI, Soprintendenza Archeologica della Lombardia, Via E. de Amicis 11 – I-20123 MILANO

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MOSETTI TECNICHE GRAFICHE SNC – VIA CABOTO, 19 – 34147 TRIESTE (ITALY) – TEL. (040) 824960 – FAX 280416