

FROM HUNTER-GATHERERS TO FARMERS

HUMAN ADAPTATIONS
AT THE END OF THE PLEISTOCENE
AND THE FIRST PART
OF THE HOLOCENE

Edited by Monica Mărgărit & Adina Boroneanț

FROM HUNTER-GATHERERS TO FARMERS

Human adaptations at the end of the Pleistocene
and the first part of the Holocene

Papers in Honour of Clive Bonsall

Edited by
Monica Mărgărit and Adina Boroneanț

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Photo cover: The Danube at Cazanele Mici (the Smaller Cauldrons) in the Iron Gates (photo Adina Boroneanț).

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PROFESSOR CLIVE BONSTALL

EDITORIAL

It is difficult to capture one's life in a few words, a few photographs or even a book. The papers in the present volume will hopefully reflect a part of Clive Bonsall's scientific interests during a career that has started some 45 years ago. Their diversity is impressive: from radiocarbon dating, environmental changes, human–environment interactions, funerary behaviour, to paleogenetics and stable isotopes, reconstruction of ancient diets and obsidian sourcing, most of them in close connection to the hunter-gatherer and first farmer communities of Europe. His studies stretched over a large geographical area, focusing recently mainly around the Balkans and the neighbouring regions. He has conducted fieldwork in Britain, Scotland, Romania and Slovenia, edited 9 books and published over 160 papers, book-chapters, notes, as well as book and paper reviews. His main publications include: "The Mesolithic in Europe" (1989), "The Human Use of Caves" (1997), "The Iron Gates in Prehistory" (2008), "Submerged Prehistory" (2011) and "Not Just for Show: The Archaeology of Beads, Beadwork and Personal Ornaments" (2017).

His substantial work in southeastern Europe is reflected by his long-standing collaboration and friendship with many Romanian and Bulgarian archaeologists, and has received due recognition: Clive Bonsall is an Honorary Member of both the "Vasile Pârvan" Institute of Archaeology in Bucharest and the National Institute of Archaeology with Museum in Sofia. His contribution to the archaeology of the Iron Gates has earned him the recognition of the Serbian archaeologists working in the area. His many other research interests and personal collaborations are also reflected in the present volume.

We are grateful to all our contributors: colleagues and friends, new and old, former students and collaborators whose archaeological interests met Clive's if only briefly. We were happy to see that so many of us were able to mobilize in such a short time. We would like to thank all those who answered our call and at a time when every minute of our professional lives is carefully planned in advance, helped us put together this volume in less than a year. They have endured and complied with our constant deadline reminders and requests, checked and re-checked their manuscripts in record times, gracefully complying with the comments and suggestions from the reviewers, and were most patient with our editorial work.

Each paper was submitted to a double reviewing. We would like to also thank our colleagues from various disciplines who accepted to anonymously review the contributions. Their hard and serious work significantly improved the overall content of the volume.

The outcome has exceeded our most optimistic expectation: a volume that geographically covers almost the entire European continent, from Britain to Russia and Greece and touches on most important issues of hunter-gatherer adaptations through time. A volume brought together by chronological landmarks (the end of the Pleistocene and the beginning of the Holocene) and geographical areas but also by common approaches to issues such as human-animal interactions, exploitation and use of raw materials, and subsistence strategies.

We chose to organize the papers on three main sections, while within the respective theme they follow in chronological succession. The archaeology of the Iron Gates opens the volume, given Clive Bonsall's substantial contribution to the local early prehistory. The eight contributions cover a large range of subjects, from physical anthropology (Andrei Soficaru), re-interpretation of earlier excavations and the subsequent collections (Adina Boroneanț), stone artefacts (Dragana Antonović, Vidan Dimić, Andrej Starović and Dušan Borić) to the study of faunal remains and subsequent paleo-dietary issues (Adrian Bălășescu, Adina Boroneanț and Valentin Radu; Dragana Filipović, Jelena

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Jovanović and Dragana Rančić; Ivana Živaljević, Vesna Dimitrijević and Sofija Stefanović), and osseous industries (Monica Mărgărit and Adina Boroneanț; Selena Vitezović). These studies illustrate the still immense research potential of the Iron Gates region despite the fact that most of the sites have been flooded many decades ago.

During the editing of the volume it became obvious that while some of the contributions focused on the evidence from a certain site, others were more of a regional synthesis. This latter section begins with a most interesting paper bringing together world history and underwater archaeology (Jonathan Benjamin and Geoff Bailey). The following nine articles deal with subjects such as social inequalities seen through the study of burial practices (Judith M. Grünberg), lifeways, adaptations and subsistence strategies of the early prehistoric communities (Agathe Reingruber; Mihael Budja; Annie Brown and Haskel Greenfield; Kenneth Ritchie), raw materials acquisition and exploitation (Tomasz Płonka, Maria Gurova, Eva David), exploitation, management and trade of „exotic” goods (Vassil Nikolov).

The nine papers focusing on individual sites present case studies that illustrate the nature of the current research, the rich opportunities offered by the growing range of scientific techniques and their applications to existing collections. This series of papers starts at Zemunica Cave on the coast of the Eastern Adriatic (Siniša Radović and Ankica Oros Sršen), explores the Mesolithic occupations at Malga Rondenetto (Paolo Biagi, Elisabetta Starnini and Renato Nisbet) and Grotta dell'Edera (Barbara Voytek) in Italy, the Mesolithic ornamented weapons of Motala in Sweden (Lars Larsson and Fredrik Molin), ending this Mesolithic journey among the shell middens on the western coast of Scotland (Catriona Pickard). The transition to the Neolithic happens among the beaver tools at Zamojste 2 in Russia (Olga Lozovskaya, Charlotte Leduc and Louis Chaix). The Neolithic Age finds us further south into Bulgaria, exploring the pitfields of Sarnevo (Krum Bacvarov and John Gorczyk) and the gold of Varna (Tanya Dzhanfiezova), while during the Bronze Age roe deer hunting is resurrected at Paks–Gyapa in Hungary (László Bartosiewicz and Erika Gál).

The volume presents altogether new results in recent research and new information resulted from the study of old collections. We also hope it points out directions for future research.

It is with great joy that we present Clive Bonsall this volume, as a token of both our appreciation and friendship, for his contributions to the Early Prehistory of Europe in general, and of Southeastern Europe in special.

The Editors

CLIVE BONSTALL – SOME YEARS AFTER

When Clive Bonsall came to Romania in 1991, I was taking an undergraduate degree in computers and wasn't even considering becoming an archaeologist. Together with my mother and brother, I used to accompany my father Vasile Boroneanț every year on his summer digs at Schela Cladovei. It was just over a year after the fall of the communist regime in Romania, and everybody at the site was waiting impatiently the arrival of a team of archaeologists from Great Britain, who were coming to visit the site and perhaps start a joint research project. It must have been past mid-night of the expected day when my father woke us up – because the “English” had arrived.... Four very tired people (Clive Bonsall, Kathleen McSweeney, Sue Stalibrass and Mark Macklin – and not all “English”) in a Land Rover but still managing to smile... They had spent 10 hours at the border between Hungary and Romania and their first encounter with Romanian cuisine had been carp-head soup (the only thing available on the menu) in Arad.... I believe Clive still remembers the fish-heads sticking out of the large bowl (obviously a reminder of the Lepenski Vir sculpted boulders...).

The visit at the site went well and the next year the research project commenced, but not uneventfully. It must have been sheer passion for archaeology and keen interest for the Iron Gates Mesolithic that made Clive come back the second year, after having (during the previous first year) the minibus tyres slashed several times by the curious and mischievous Schela Cladovei lads, bits of the flotation equipment vanishing into thin air and two pairs of his new Levis jeans (a rarity in Romania in those days) mysteriously disappearing from his room at the youth camp in Gura Văii.....Not to mention the breaking down of the minibus in a country where there were no spare parts for western cars.

Still, here he is, working in Romania, 26 years later...

And following the first four years of the Schela Cladovei project I had switched to a degree in archaeology (and Clive bears much of the blame...). And we are still excavating at Schela Cladovei...and at least Clive looks unchanged... It is his dedication to the archaeology of the area that has made this second research project possible, project going on successfully for over ten years now.

As it was with me, Clive has influenced the lives of many (older and younger) archaeologists and perhaps future archaeologists. He is an inspiration to our students from the Schela Cladovei excavation and a respected professional among Romanian archaeologists. He has always been ready to help my fellow colleagues, whether it was field work, collecting samples, editing or mere professional advice, although such work had rarely anything to do with the archaeology of the Iron Gates. But during his entire activity in this area, he acted as a “human bridge” between Romanian, Bulgarian and Serbian archaeologies, facilitating professional exchanges, easing the access to modern technologies, information and publications.

Clive Bonsall was/is equally interested in other geographical areas and research topics of European (and not only...) archaeology, and the number of people contributing to this volume testify to the impact he had on individuals and archaeologies elsewhere outside Romania.

This may not be the typical introduction to a Festschrift volume... but then, Clive is not a typical person. Rather cynical but warm hearted underneath, with a wonderful (and at times very dry) sense of humour, and great charm (when he wants it...) he makes a great project co-director and fellow-worker.

I can only but hope that our collaboration would go on for many years from now and that we'll get to see the end of the Schela Cladovei trench we started before we both retire!

Bucharest, September 2017

Adina Boroneanț

PUBLICATIONS OF CLIVE BONSTALL

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Mesolithic Miscellany, 1991-1996. vols 12-17 — an international newsletter with subscribers throughout Europe and North America, as well as in Japan and Africa.

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MALGA RONDENETO: A HIGH ALTITUDE SAUVETERRIAN CAMP IN THE CENTRAL ITALIAN ALPS AND THE BOREAL MESOLITHIC SETTLEMENT PATTERN IN THE REGION

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Abstract: The surveys carried out along the Val Camonica-Val Trompia-Val Sabbia watershed in the central Italian Alpine arc, have led to the discovery of many high altitude Mesolithic Sauveterrian sites, a few of which have been excavated. This paper discusses the Boreal Mesolithic peopling of the area. It is based mainly on the evidence provided by the results of the excavations conducted at the small summer camp of Malga Rondeneto in Upper Valcamonica (1780 m). Malga Rondeneto was briefly settled by a group of middle Sauveterrian hunters who produced their microlithic weapons on the spot. The site is located very close to a radiocarbon-dated peat sequence that helps interpret the characteristics of the environment that evolved in the area between the beginning of the Holocene and the Bronze Age. Other high altitude Boreal Mesolithic sites are known not only along the three sides of the watershed discussed in this paper, but also in the Camonica Valley bottom.

Keywords: Italian Alpine arc, Boreal Mesolithic, Middle Sauveterrian, lithic assemblages, environmental reconstruction, radiocarbon chronology.

Preface

During the last decades, high altitude archaeology studies have greatly improved in the Alps (Cavulli and Grimaldi 2009; Cornelissen and Reitmaier 2016; Kompatscher *et al.* 2016) and other European mountain ranges, among which the Pyrenees (Ejarque *et al.* 2010; Orengo *et al.* 2014), the Pindus of Western Macedonia (Biagi *et al.* 2016), the Rhodopes (Ivanova 2006), and the Caucasus (Doronichev 2008; Doronicheva *et al.* 2012). In particular, several research projects have been promoted to study the effects of human interference on mountain environment, and the reasons people settled at high altitude

mountain zones in different ages (Biagi and Nandris 1994; Della Casa 1999; Larentis and Pedrotti 2003; Fontana *et al.* 2016).

Recent discoveries made in south-eastern Europe have shown that mountains began to be settled and exploited since the very beginning of the Palaeolithic (Vekua *et al.* 2011; Moncel *et al.* 2013). Considering the important role that high altitude archaeology plays in the present archaeological debate, the scope of this paper is to discuss and overview a specific period of the early Holocene mountain exploitation. More precisely, the second half of the early Mesolithic period, when mid-Sauveterrian,

Boreal hunter-gatherers seasonally settled within the unique territory of the central Italian Alpine arc, the Val Camonica-Val Trompia-Val Sabbia watershed of the Brescia province in Lombardy (Fig. 1).

The Boreal period is especially interesting because it represents both the best documented and longest period of Mesolithic human exploitation of the Italian mountain environment. During the Boreal, a few millennia after the deglaciation that took place around the end of the LGM (Cavallin *et al.* 1997), groups of early Holocene hunters once again moved up into the easily accessible territories of the Alpine range, most probably for hunting purposes. Therefore the study region is interesting not only for the interpretation of the climatic changes that took place throughout the period, but also for the study of the behaviour, resilience and adaptation strategies of the Mesolithic hunter-gatherer communities to the new environmental conditions that developed at the beginning of the Holocene, and the systematic climatic amelioration that led to the Atlantic period (Grimaldi 2005).

During the last 30 years our knowledge of the archaeology of the Pleistocene-Holocene transition of the study region has greatly improved thanks to discoveries made mainly by local amateurs, and excavations carried out by institutional research programmes (Franco 2011). The results have contributed to the interpretation of the processes that led both the prehistoric groups of hunters and protohistoric-historic communities of farmers to gradually settle and exploit this part of the south-central Alpine arc (Biagi 1992, 1993, 1998; Biagi *et al.* 1994a, 1994b; Baroni and Biagi 1997; Berruti 2006; Biagi and Starnini 2015).

The study of the Mesolithic period in the Italian Alps began to arise in 1969, after the occasional discovery of the rock-shelter of Vatte di Zambana in the Trento basin (Clark 2000; Broglio 2016). A few months later it was followed by other discoveries in the Adige valley bottom and, unexpectedly, also in the

high-altitude Alps of the Trentino (Bagolini and Dalmeri 1992; Broglio 1992; Grimaldi 2006).

The excavations and surveys that followed showed for the first time in Italy that the Mesolithic hunter-gatherers did exploit the Alpine arc, in contrast with the opinions expressed by most authors in the 1960s. The new evidence contrasted with the general view of that time, according to which man had never inhabited the Italian central-eastern Alpine chain before the Iron and Roman periods (Ravagni 1930).

The Boreal Mesolithic settlement along the watershed of the Brescian Alps

The excavations carried out in 1987 at the Roman settlement of Cividate Camuno, Via Palazzo, along the left (eastern) bank of the Oglio River (Fig. 1/ 1), accidentally brought to light the most important long sequence ever discovered in the middle Valcamonica (Martini *et al.* 2016). The lowermost layer yielded the remains of a structure containing a small Epigravettian assemblage, radiocarbon-dated to $13,805 \pm 440$ BP (GX-17273), suggesting that this part of the valley was already deglaciated during the Late Pleistocene, the final Epigravettian times. The overlying Mesolithic, Boreal occupation has been dated to 8820 ± 112 BP (GX-18843) (Martini *et al.* 2016, Fig. 3). The site location is unique. It lies where the Oglio River, flowing across the gorge that narrows its course, bands toward the south-west, and the present-day alluvial plain opens, favouring the establishment of *Civitas Camunnorum* (Cividate Camuno), the most important Roman city of the entire valley (Bozzi and Sacchi 2016). Here, the Boreal Mesolithic structure was uncovered at an altitude of 273 m. The site lies close to the bottom of the Grigna Valley, whose highlands are marked by the presence of the two small glacial Ravenola Lakes (1957 m; Fig. 1/ 3). The higher of the two yielded traces of Boreal Mesolithic occupation, radiocarbon-dated on *Picea/Larix* charcoals to

8160±100 BP (GrN-26800) and 8725±40 BP (GrA-59653), both originating from the same fireplace, uncovered at 45°51'12"N-10°21'36"E (Biagi and Starnini 2015. 251 and Table 1).

Malga Rondeneto

The surveys carried out in the 1980s and the 1990s along the Val Camonica-Val Trompia-Val Sabbia watershed were made possible thanks to the patronage and the financial support of the Museo Civico di Scienze Naturali di Brescia. During those years, a few Mesolithic sites and lithic scatters were discovered, among which Malga Rondeneto, identified at 1780 m of altitude (45°50'42"N-10°15'23"E) (Fig. 1/ 2). The site was found by chance in October 1988 by L. Caniato of the Museo Civico di Scienze Naturali di Brescia at the upper limit of the present arboreal cover, mainly composed of sparse *Larix* trees (Fig. 2).

The excavation

The excavation of the site was carried out in July 1992 by a crew of 5 people, among whom were two of the present authors (P.B. and E.S.) and it lasted only one week. The excavation trench covered a surface of 15 sqm, representing the whole extension of the small camp.

After removing the topsoil with the aid of a shovel, the excavation was done by hand with WHS trowels. All the visible artefacts had their spatial coordinates recorded *in situ* according to their grid and stratigraphic position (Fig. 3, bottom). Thanks to this method it has been possible to recover microlithic artefacts down to 4 mm of length, with a good recovery rate. Despite their small dimension, the visibility of the chipped stones was indeed good, because of the grey archaeological deposit that contrasted with the lighter colour of the lithic tools, allowing the recovery during the excavation of 15 of the 16 tools and 11 of the 12 microburins. However, all the excavated deposit was water-sieved with a sedimentology screen of 2, 1 and 0.5 mm column meshes respectively. Following this method we could retrieve not only the two

implements unrecovered during excavation, but also most of the 470 shatters, debitage and debris hypermicroflakelets, which changed our view of the activities performed at the site (Fig. 3, top; Fig. 4). Their presence is a good proxy to assess the post-depositional disturbances that seem to have been minimal. The good preservation of the excavated part of the site is inferred also by the presence of a small hearth from which most charcoals were retrieved. Thus we can safely assume that the eroded part of the site was minimal, only along the northern side, where the archaeological deposit was discovered just after the spring snow melting (Fig. 2, bottom).

The chipped stone assemblage

The site yielded a small chipped stone assemblage distributed over an oval-shaped area of only 12 sqm (Fig. 3, bottom). At the north-western edge, a small fireplace containing *Picea/Larix* charcoals was excavated and radiocarbon dated to 8880±150 BP (GrN-20886) (Biagi 1993. 39). The artefacts were recovered in a horizontal position mainly from the top of a grey silt and sand podsol, just beneath the turf topsoil at the maximum depth of 29-35 cm. The archaeological horizon was covered by a peat deposit whose accumulation started during the first centuries of the third millennium BP, as confirmed by two radiocarbon dates obtained from thin sheets of turf collected from the lowermost levels of the sequence (2830±50 BP: GrN-19812 and 2780±25 BP: GrN-19587) (Scaife and Biagi 1994. 150). The aforementioned dates show an abrupt break in the sedimentary formation of the sequence.

The chipped stone assemblage recovered *in situ* consists of 164 artefacts, among which 74 (45.1%) are unretouched complete, 66 (40.3%) are unretouched fragments, and 24 are tools, 1 core included (14.6%). 27 pieces are corticated (16.5%), and 17 burnt (10.4%). The retouched tools are represented by 5 microlithic, scalene, triangular armatures (Fig. 5/1-4, 7; Fig. 6/1-5), one hypermicrolithic marginal truncation, 3 microlithic backed points (Fig. 5/5, 6, 8),

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one backed microbladelet (Fig. 5/15), and 6 marginal sidescrapers (Fig. 5/9-13, 17). The industry includes also 12 microburins (Fig. 5/18-29; Fig. 6/6-16) that are by-products of the armatures' production, one exhausted, pyramidal, microbladelet core (Fig. 5/14),

74 complete debitage flakes and micro-blades (blanks) that were measured to develop the diagrams of Fig. 7, and 470 debitage debris and shatters, mostly recovered by water sieving (Table 1).

Table 1. Malga Rondeneto: structure of the chipped stone industry retrieved from excavation.

Typology and characteristics	No. of items	Used
Truncation	1	-
Backed bladelet	1	-
Backed points	3	-
Geometric armatures: Scalene triangles	5	2
Sidescrapers with simple or abrupt, marginal, direct retouch	6	1
Microburins (proximal)	6	-
Microburins (distal)	6	-
Microbladelet pyramidal core, single platform, unidirectional	1	-
Unretouched pieces and debris	470	-
(Corticated pieces)	(27)	(-)
(Burnt pieces)	(17)	(-)
TOTAL	499	3

The structure of the lithic assemblage shows that the human activity at the ephemeral Rondeneto summer camp (see the next paragraph) was related to the manufacture and maintenance of hunting weapons, though other activities were also performed as indicated by a sidescraper with wear traces from cutting soft material (Fig. 5/ 17). Moreover, the composition of the raw materials reflects the behaviour of the group: some tools, namely the triangular armatures made of a light yellowish brown flint, were most probably brought to the camp as finished tools, because of the absence of microburins related to their production. In contrast, most of the debitage waste is made of different shades of grey cherts/flints that seem to derive from the preparation of new armatures, later exported from the site, whose by-products (debitage discards, core maintenance pieces, and microburins) were discarded on the spot. One single, exhausted "scaglia rossa" chert core (10R4/3: weak red) was

abandoned at the site (Fig. 8/10), though by-products associated to its debitage were totally absent. Therefore, since it is most improbable that the artefacts detached from the above mentioned core have been dispersed by post-depositional events, the core was most probably left at the site because no more suitable blanks could be further obtained.

Most of the artefacts were obtained from non-transparent or slightly translucent at the edge, waxy grey cherts/flints of different shades (Fig. 8/2-9, 11), one piece of which conserved a brown siliceous cortex (Fig. 8/8). The armatures are instead made from a light yellowish brown flint (10YR6/4) (Fig. 8/1); whilst other lithotypes of unknown sources are represented by single pieces, including one partly corticated core (Fig. 8/10). The raw material was collected most probably from secondary deposits in the form of pebbles/ nodules as inferred from the few cortex residuals.

The use wear analyses performed at a low power microscope by B.A. Voytek showed that only three tools had been used: two triangular armatures with traces of hafting (Fig. 5/1, 4), one with an impact fracture at one tip (Fig. 5/1), and a sidescraper, used for cutting soft material (Fig. 5/17). There were no tools used in butchering or preparing hides, skinning or similar activities. Moreover none of the several microburins has been used, confirming their nature of technological discarded residuals. In sum, the lithic assemblage suggests that the site is to be interpreted as a short-term activity area.

The local forests

At present Rondeneto lies just above the upper limit of the broadleaves forest that is mainly composed of a close mountain association of *Alnus viridis*, and is surrounded by alpine pastures with a sparse vegetation of *Larix decidua* and *Rhododendron hirsutum*.

Two pollen cores from Malga Rondeneto area, one from the podsol within the archaeological site, and the other ca 20 m below it, in a section of a peat-bog filled by macro-remains of wood and *Picea* cones (Biagi and Starnini 2015, Fig. 4), were sampled in 1992 and published two years after (Scaife and Biagi 1994). The sedimentary correlation between the two sections, the pollen profiles and the ¹⁴C dates from both areas provide evidence of dry climatic conditions during the early Holocene in this part of the Alps (ca. 9500-8000 uncal BP), preventing peat accumulation and leading to open surfaces suited to short, seasonal high altitude Mesolithic occupation. The ephemeral Mesolithic camps could use the ecotonal belt between the tree line and the upper montane pasture, close to small lakes, without any evidence of important changes in the local vegetation due to human presence. It is thus suggested that the Boreal forest could be found at a somewhat lesser altitude than in the present days. In this context, the small fireplace entirely made of *Picea/Larix* charcoal should be interpreted as an indication of the presence of the coniferous forest on the lower

slope, where the wood was collected and then transported to the site. Of some interest for their infrequent occurrence in the archaeobotanical record are the sporangia and spores of *Botrychium* cf. *lunaria*, a taxon close to the fern families, which lives in pastures and open spaces and ripe in July and August, and which had been found in both charcoal and pollen analyses. Charred remains of this taxon were recovered by water sieving and are an ideal indicator of the summer exploitation of the site.

After ca. 8000 uncal BP, increased humidity in the area favoured peat accumulation and the upper tree line started to move uphill, as shown in the pollen profiles, by the curves of the *Betula*, *Pinus*, *Picea*, *Quercus*, *Alnus* and *Corylus*, however always with a strong herb component (Scaife and Biagi 1994, 148).

The early spread of the conifer forest between 1500 and 2200 m in the eastern Alps since the Preboreal was established by several pollen (for instance Hirschbichl: Oeggl and Wahlmüller 1994; Lago delle Buse: Kofler 1994, and many other sites) and charcoal (e.g. Colbricon with *Larix/Picea*, *Pinus* spp., *Rhododendron*; Lago di Stellune with *Larix decidua* Miller: Castelletti 1983) analyses.

A similar picture has been established by both micro- and macroremains analysed in the central Alps also for the following Boreal and early Atlantic periods, that is the Castelnovian Late Mesolithic (Crestoso, Stanga di Bassinale: Baroni *et al.* 1990; Biagi *et al.* 1994a; Val Camonica: Pini *et al.* 2016), with the local predominance of the *Picea* and *Larix* or *Pinus* sp., but always showing the occurrence of the conifer forests in the subalpine belt.

On the ground of pollen analytical research, it has sometimes been suggested that during the Boreal and early Atlantic periods, the Mesolithic hunters practiced a broad control on the upper limit of the conifer forests by localized fires (*Feueraktivität*) not only in the Alps (Wick and Möhl 2006; Berthel *et al.* 2012; Schwörer *et al.* 2014) but also in the Mediterranean hills and lowlands

(Colombaroli *et al.* 2008; Beffa *et al.* 2016) as well as in some mountain regions of the central-eastern Spain (Gil-Romera *et al.* 2010). We have seen that the pollen curves at Rondeneto do not show any evidence of this kind of control, as evidence of artificially created open landscape and meadows in an otherwise forested environment.

According to the available data (macro-botanical remains mostly consisting in waterlogged trunks, branches and cones perfectly preserved in peat) provided by years of surveys in the study area, coniferous forests spread upward only at the end of the Boreal period (Ravenola: *Picea/Larix*, cf. *Sorbus* charcoals). At present, the only evidence of *in situ* forests in the region comes from woods, branches, trunks, cones, of at least 12 peat sites, mostly located close to the watershed and in the upper part of the slopes (Fig. 9; Fig. 10). The only site not strictly belonging to this area, discovered farther north just below the Gavia Pass, namely the Lago Nero di Cadino (2390 m), is the oldest of the series, with a late-Boreal date of 8075 ± 50 BP (GrN-19586) (Fig. 10, bottom).

Ten dates of Atlantic age come from samples LRN-2, LRN-3, DBT-2, RVN-2, VAIA-1, DBT-4/3, DBT-4/2, DBT-4/1, DDA-1 and MSF-1 (Fig. 9; Table 2). They are all located between 1770 and 2050 m of altitude. They show that a wetter climate followed the 8.2 ka episode, favouring in many instances the peat formation, though it was not an obstacle to the diffusion of the coniferous belt at this altitude. A feature common to all mentioned sites is the unique presence of sapwood trees, almost exclusively *Picea/Larix* and *Picea* (some cones of the latter *taxon* have been found, for instance in DBT-4/1 and LRN). Up to now, no heartwood species have been found in the bogs (in some scattered charcoals or fireplaces few *Rhododendron* branches were determined).

To follow the evolution of the local forest during more recent chronozones through the macroremains is more difficult. The evidence becomes scanty (DBT-5/3, DBT-1, MAI-2) though interestingly made of the same *taxa* at

roughly the same altitude. A very recent date of 400 ± 30 BP (GrN-18984) from DDA-3 (1775 m), is clear evidence that even at a post-medieval age the slope (at least in this limited area) was forested as it still is at the present moment.

Discussion

According to the data presented above, the site of Malga Rondeneto is to be attributed to the Boreal Mesolithic Middle Sauveterrian aspect, which is well known from the Romagnano III sequence in the Trento basin (AC4: Fontana *et al.* 2015. Table 1). Both the chipped stone assemblage and the archaeobotanical data would point to the interpretation of the site as a logistic, seasonal camp, briefly settled by a few hunters during the warmest summer months (Marchand 2015. Table 1).

So far, only five Sauveterrian sites are known from the study region (Fig. 1). Three are located at high elevation (i.e. above 1700 m: Malga Rondeneto, Lago di Ravenola and Lago di Vaia: Biagi and Starnini 2015), one has been excavated in the middle Camonica Valley bottom (Civitate Camuno: Martini *et al.* 2016), and one has been discovered on a middle altitude river terrace (830 m), 7 km west of the southern edge of Lake Idro in Val Sabbia (Vaiale: Biagi and Nisbet 2008). Summing up, three sites have yielded comparable radiocarbon dates falling within the first half of the ninth millennium BP; Lago di Vaia (Fig. 1/4) should belong to the end of the Sauveterrian period (GrA-48363: 8285 ± 45 BP), whilst Vaiale is undated because of the absence of organic material and *in situ* Mesolithic structural remains recovered during excavation (Fig. 1/5), although from a typological point of view, the chipped stone assemblage can be attributed to this period. However, the picture presented in this paper shows how scarce our knowledge of the Boreal Mesolithic period in the study region is, in contrast with what is known, for instance, from neighbouring Trentino-South Tyrol (i.e. Wierer *et al.* 2016. 104).

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Table 2. Location, altitude, depth and radiocarbon results of the *Picea/Larix* buried forests sampled along the watershed.

Site name	Initials	Altitude (m)	Coordinates	Lab. number	Dated material	Depth (cm)	$\Delta^{13}\text{C}$	Uncal BP	Cal BC/AD (1 σ)	Reference
Lago Nero di Cadino	LNR-2	2390	46°20'05"N-10°29'04"E	GrN-19586	<i>Picea/Larix</i> wood	-110	-23.44	8075±50	7019±103	Unpublished
Lago di Rondeneto	LRN-2	1770	45°50'55"N-10°15'23"E	GrN-18252	<i>Picea/Larix</i> wood	-90	-23.38	7710±50	6547±50	Biagi 1992. 370
Dosso Betti	DBT-2	1900	45°52'00"N-10°19'22"E	GrN-24808	<i>Picea/Larix</i> wood	-60	-25.95	7360±30	6238±72	Unpublished
Lago di Rondeneto	LRN-3	1770	45°50'55"N-10°15'23"E	GrN-18253	<i>Picea/Larix</i> wood	-35	-22.66	7175±50	6048±34	Biagi 1992. 370
Ravenola	RVN-2	2000	45°51'48"N-10°22'00"E	GrN-24819	<i>Picea/Larix</i> wood	-150	-24.167	6910±30	5793±37	Unpublished
Lago di Vaia	VAIA-1	2050	45°52'05"N-10°23'17"E	GrN-29016	<i>Picea/Larix</i> wood	-80	-22.79	6490±30	5443±41	Unpublished
Dosso Betti	DBT-4/3	1800	45°51'25"N-10°19'32"E	GrN-24811	<i>Picea/Larix</i> wood	-81	-24.66	6180±40	5136±61	Unpublished
Dosso Betti	DBT-4/2	1800	45°51'25"N-10°19'32"E	GrN-24810	<i>Picea/Larix</i> wood	-72	-24.01	5960±25	4849±39	Unpublished
Dosso dell'Asino	DDA-1	1850	45°52'46"N-10°17'55"E	GrN-18089	<i>Picea/Larix</i> wood	-90	-25.42	5820±45	4675±59	Unpublished
Malga Stabil Fiorito	MSF-1	1930	45°51'14"N-10°19'00"E	GrN-24818	<i>Picea/Larix</i> wood	-50	-23.89	4940±40	3722±44	Unpublished
Dosso Betti	DBT-4/1	1800	45°51'25"N-10°19'32"E	GrN-24809	<i>Picea</i> cones	-38	-24.64	4920±60	3721±55	Unpublished
Dosso Betti	DBT-5/3	1800	45°51'27"N-10°19'33"E	GrN-24815	<i>Picea/Larix</i> wood	-85	-26.13	3470±20	1812±50	Unpublished
Dosso Betti	DBT-1	1900	45°51'52"N-10°19'28"E	GrN-24807	<i>Picea/Larix</i> wood	-30	-24.66	1860±20	153±41 AD	Unpublished
Malga Mai	MAI-2	1830	45°51'36"N-10°21'17"E	GrN-26799	<i>Picea/Larix</i> wood	-40	-23.13	1830±30	178±39 AD	Unpublished
Dosso dell'Asino	DDA-3	1775	45°52'50"N-10°18'02"E	GrN-18984	<i>Picea/Larix</i> wood	-35	-24.92	400±30	1516±67 AD	Unpublished

The assemblage from Malga Rondeneto shows that the site was briefly settled by a small group of hunters who moved along the watershed during the summer season (July or August). Here they reconditioned their hunting equipment. This is shown by the presence of triangular armatures made of light yellowish brown flint (Fig. 8/1), two of which were hafted (Fig. 5/1, 4) and one had impact traces (Fig. 5/1), and debitage flakelets, debris, shatters and microburins of slightly different varieties of non-transparent grey chert (Fig. 8/2-9) showing that the manufacture of new armatures used as barbs for arrows took place within a few square metres around the small fireplace.

At present, both their itinerary and base camp(s) are unknown. The only available data would point to an eventual logistic relationship between Cividate Camuno and Lago di Ravenola. The two sites are located respectively at the bottom (Cividate Camuno) and the head (Lago di Ravenola) of Valle della Grigna, a communication valley that takes to Pass Dasdana (2071 m), across which lies Val Giudicarie, where an undated Mesolithic site has been recorded along the shore of Lago Dasdana (Biagi 1985. Fig. 96), and Val Sabbia farther down. The mobility pattern and the seasonality of the settling of the Mesolithic bands in the study region seems to differ from that of the Mesolithic Trentino-South Tyrol hunters, where the environmental characteristics and the abundance of sites suggest quite a long permanence at high altitude and a longer or repeated use of some sites (Kompatscher and Hrozny Kompatscher 2007; Kompatscher *et al.* 2016; Wierer *et al.* 2016).

Moreover, throughout the entire Mesolithic, hunters of different stages seem to have followed different routes, settling in different locations period by period. This is evident from the study of the Preboreal assemblages from Malga Valmaione (Biagi and Starnini 2016) and the Castelnovian sites of Laghetti del Crestoso and Sella Val Glisente (Baroni and Biagi 1997). The same can be said for the exploitation of the

raw materials for making implements that vary period by period and might help interpret their main movement routes and the itineraries they followed. These data corroborate the hypothesis that the watershed under study was sporadically settled during well-defined periods of the early and middle Holocene, and the exploitation of its alpine environment was definitely chronologically and culturally non continuous and geographically inhomogeneous.

The differences between the lithic assemblages recovered from Cividate Camuno and Malga Rondeneto are remarkable: they regard the number of tools, debitage pieces and microburins as well as the presence/absence of specific tool types. This fact is to be related to the different functions performed at the two sites, and their season, period and length of occupation.

Acknowledgements. The research at Malga Rondeneto was made possible thanks to a contribution by the Museo Civico di Scienze Naturali di Brescia that also financed the radiocarbon dating of the forests discovered along the watershed.

The map of Fig. 9 has been elaborated from the background furnished by the NASA Blue Marble data product, retrieved from the online Data Pool, courtesy of the NASA Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota, https://lpdaac.usgs.gov/data_access/data_pool.

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From hunter-gatherers to farmers
Human adaptations at the end of the Pleistocene and the first part of the Holocene

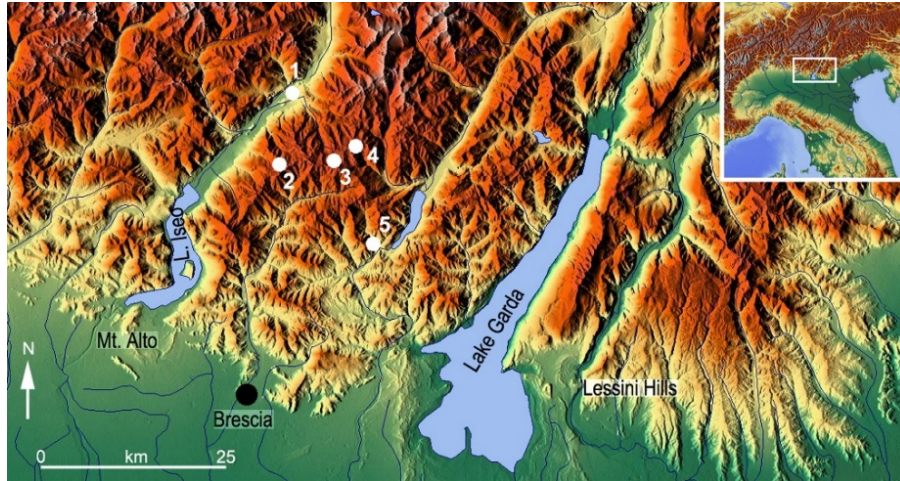


Figure 1. Distribution map of the Boreal Mesolithic sites in the study region (Cividate Camuno (1), Malga Rondeneto (2), Lago Ravenola (3), Lago Vaia (4), Vaiale (5) (drawing by Elisabetta Starnini).



Figure 2. Malga Rondeneto: the site during the 1992 excavations (top), and the precise location of the first finds that led to its discovery (bottom, arrow) (photos by Paolo Biagi).

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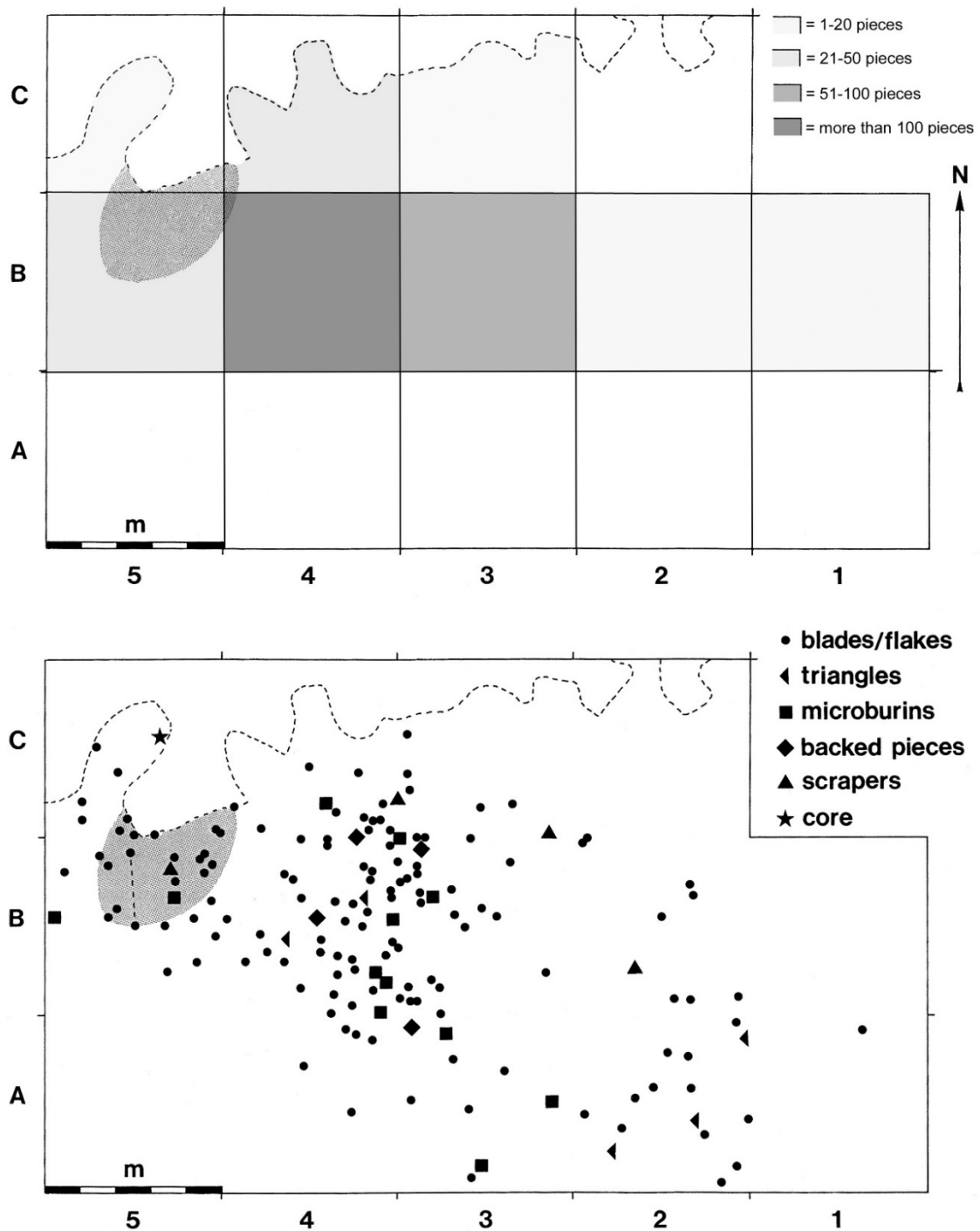


Figure 3. Malga Rondeneto: distribution map of the chipped stone pieces retrieved by water sieving (top) and the finds recovered during excavation (bottom). The oval shaded area in square B₅ marks the presence of a small hearth (drawings by P. Biagi and E. Starnini).



Figure 4. Malga Rondeneto: debitage debris and shatters retrieved by water sieving from square B4. A small microburin is marked by a rectangle (photo by E. Starnini).

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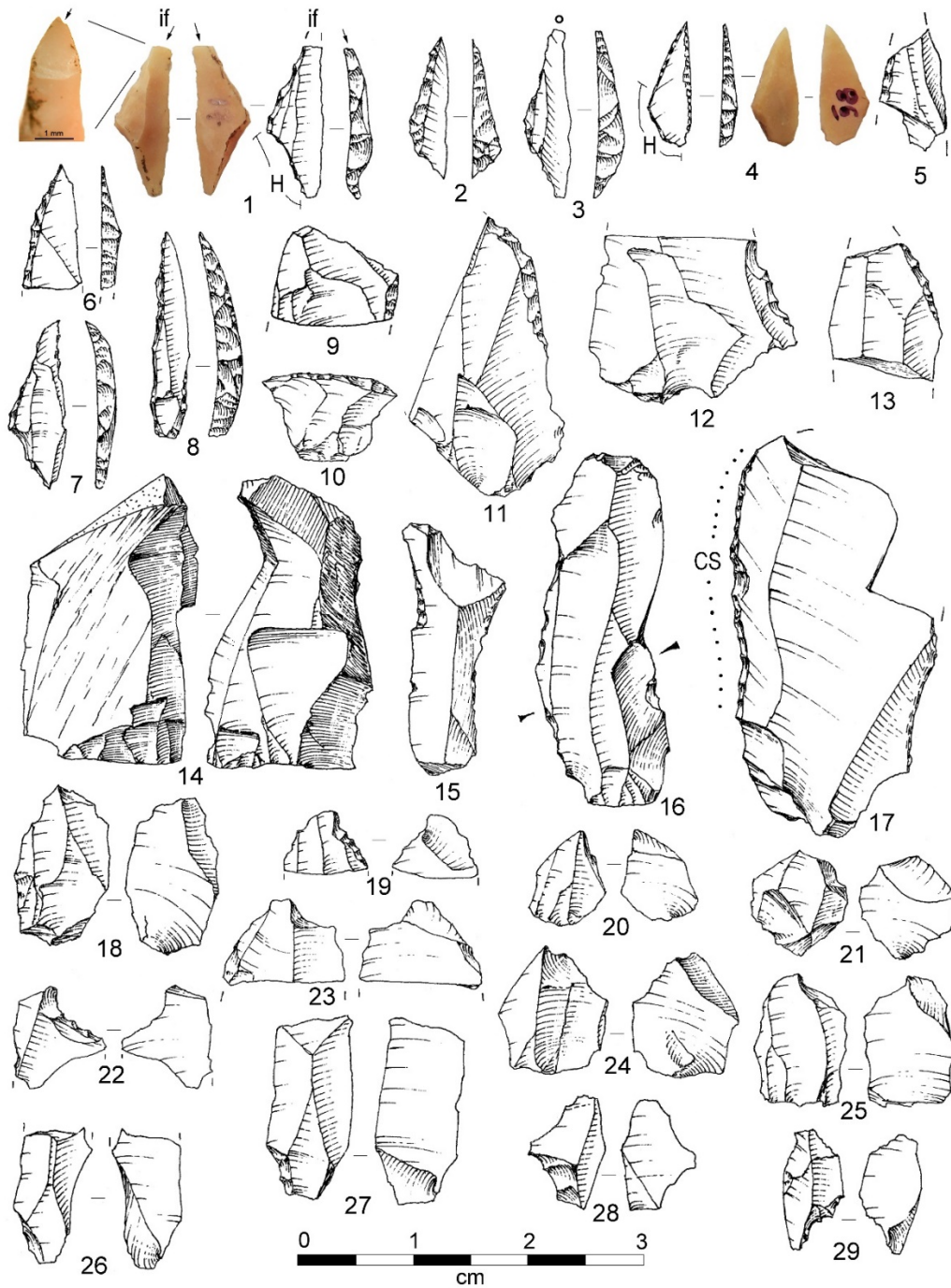


Figure 5. Malga Rondeneto chipped stone assemblage: scalene, triangular armatures (1-4, 7), backed points (5, 6, 8), side scrapers (9-13, 17), backed bladelet (15), core (14), refitted bladelet (16), microburins (18-29), impact fractures (if), hafting traces (H), cut soft (CS) (drawings by G. Almerigogna, photos by E. Starnini).

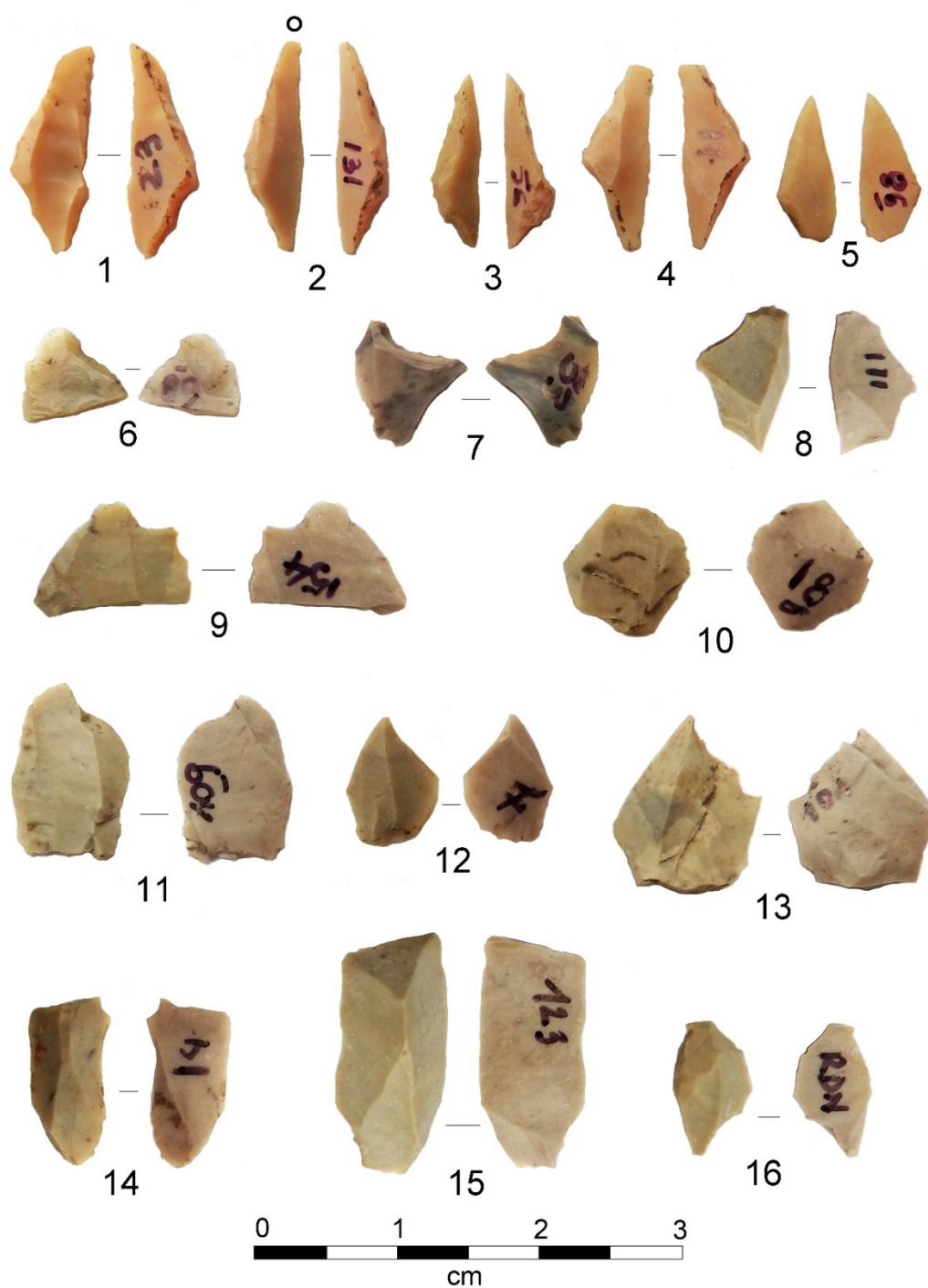


Figure 6. Malga Rondeneto chipped stone assemblage: scalene, triangular armatures (1-5), microburins (6-16) (photos by E. Starnini).

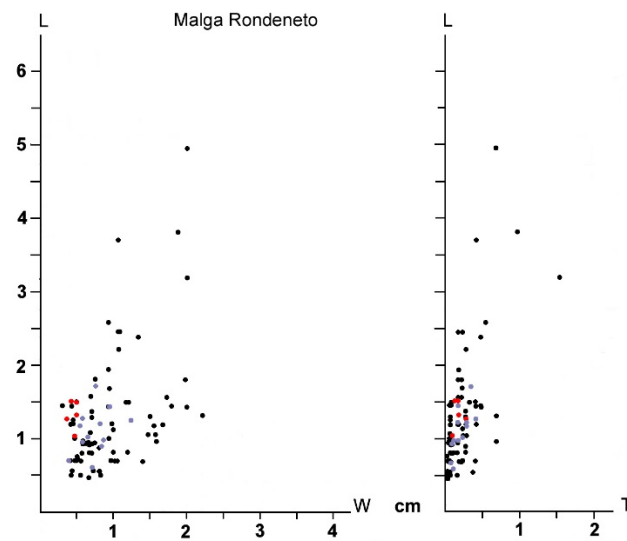


Figure 7. Malga Rondeneto: dimensional length/width and length/thickness diagrams of the complete, unretouched artefacts (blanks) recovered during excavation (black dots), microburins (blue dots), and triangular armatures (red dots) (drawings by P. Biagi).

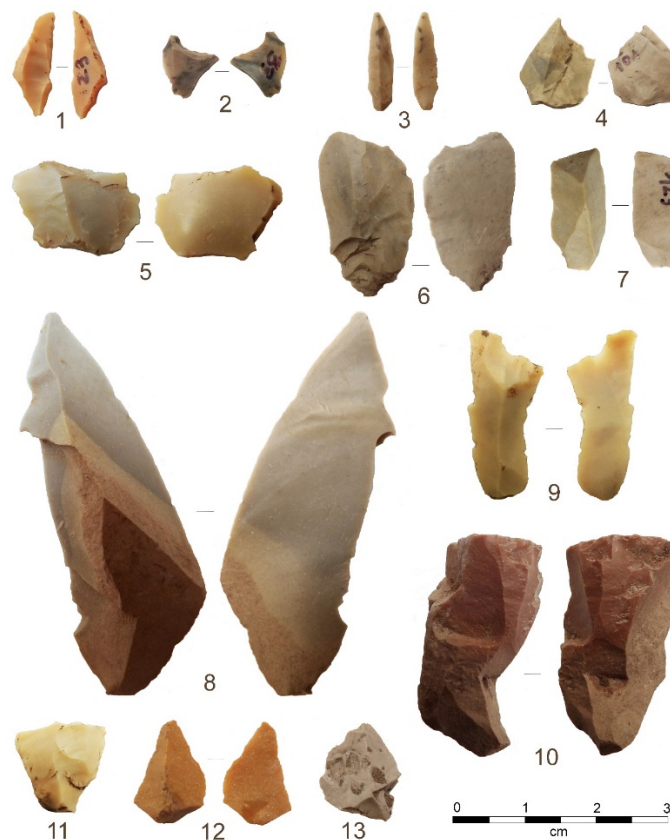


Figure 8. Malga Rondeneto chipped stone raw materials: light yellowish brown flint (1), grey chert and flint (2-9, 11), “scaglia rossa” chert (10), strong brown radiolarian chert (12), burnt piece (13) (photographs by E. Starnini).

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Figure 9. Distribution map of the buried forests discovered along the watershed in relation to the Boreal sites of Lago di Ravenola (3) and Lago di Vaia (4). Radiocarbon dated forests (yellow dots), undated forests (red dots) (drawings by R. Nisbet and E. Starnini).



Figure 10. Buried forests sampled for radiocarbon dating above Lago di Vaia (VAIA-1, top) and Lago Nero di Cadino (LNR-2, bottom) (photos by P. Biagi).