Quaternary International xxx (2017) 1–17

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

The beginning of the Neolithic in the Po Plain (northern Italy): Problems and perspectives

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ARTICLE INFO

Article history:
Received 21 November 2016
Received in revised form
17 May 2017
Accepted 19 May 2017
Available online xxx

Keywords:
Northern Italy
Po Valley
Early Neolithic Vhò/Fiorano cultural aspects
Radiocarbon dating
Subsistence and technology

ABSTRACT

The Po Valley is one of the major physiographic units of northern Italy. It can be considered as a key area for the interpretation of long-term historical events and processes because of its location midway between the Mediterranean world and continental Europe. This paper is an updated summary of our knowledge of the Early Neolithic farming communities of the region. In particular it discusses data derived from radiocarbon dated sites. Its aim is to provide the international audience with an updated view of the topic, based on the discussion of a new series of AMS radiocarbon results, to frame the earliest producing communities of the Po Valley into the more general picture of the Neolithization of Italy. To achieve the goal, apart from radiocarbon assays, we have taken into consideration material culture remains, subsistence economy, environmental resources, and data gathered from archaeometric analyses and technology.

1. Introduction

According to the opinion of non-native scholars, much of the work published by the Italian archaeologists on the Neolithic of Italy during the last decades "*can often be characterized in terms of an obsession with typometric description of ceramic and lithic artefact attributes and their stylistic affinities*" (Skeates, 2014: 1) and that Italian prehistory is "*still married to an exclusively chrono-typological model*" (Pearce, 2014: 157).

Furthermore, as remarked by foreign colleagues (Pearce, 2013: 11) a further difficulty is that much important archaeological literature about Italian prehistory is published in Italian and in local editions that have little circulation even in Italy and none at all abroad.

Bearing in mind the above premises the scope of this paper is an attempt to update our knowledge on the Early Neolithic period in the Po Plain of northern Italy in a wider perspective. The paper focuses mainly on the discussion of the data retrieved from radiocarbon dated sites that started to be discovered already just after the middle of the 19th century (Chierici, 1875a, 1875b, 1877). Its aim is to provide the international audience with an updated view of the topic, based on a series of new, unpublished radiocarbon dates, discussing the previously available results, in order to frame the earliest producing communities of the Po Valley into the more general picture of the Neolithization of Italy. As a consequence, the present paper does not deal exclusively with material culture remains. In contrast, it takes into consideration subsistence economy, environmental resources, data gathered from archaeometric analyses and technology.

2. The present and the past landscape: environment and resources

The Po Valley is one of the major landscape physiographic units of Italy. It extends approximately 650 km in an east-west direction, running from the Western Alpine arc, where the Po River, the longest watercourse of the Peninsula, originates, down to the Adriatic Sea (Fig. 1). It covers an area of ca. 46,000 square kilometers including its Veneto extension not actually related to the Po River basin. The flatlands of the Veneto and Friuli regions are considered apart since they do not drain into the Po, though they effectively

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http://dx.doi.org/10.1016/j.quaint.2017.05.059
1040-6182/

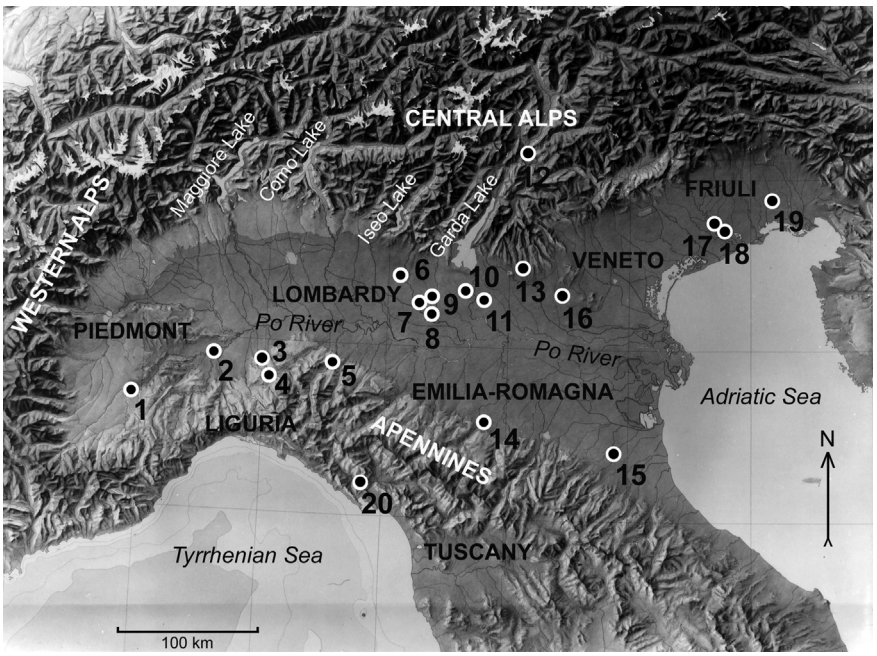

Fig. 1. Map of northern Italy with localities and Early Neolithic sites mentioned in the text: 1) Alba (CN); 2) Il Cristo (AL); 3) Cecima (PV); 4) Brignano Frascata (AL); 5) Travo (PC); 6) Il Vallone di Offlaga (BS); 7) Ostiano (CR); 8) Vhò di Piadena (CR); 9) Isorella (BS); 10) Cavriana (MN); 11) Roverbella (MN); 12) Riparo Gaban (TN); 13) Lugo di Grezzana (VR); 14) Fiorano (MO); 15) Lugo di Romagna (RA); 16) S. Giustina di Baldaria (VR); 17) Fagnigola (PN); Valer (PN); 19) Sammardenchia (UD); 20) Pianaccia di Suvero (SP).

combine into an unbroken plain. The plain itself is the surface of an in-filled system of ancient canyons (the "*Apennine Foredeep*") extending from the Apennines, in the south, to the Alps, in the north, including the northern Adriatic. The altitude of the valley through which the Po River flows, exclusive of its tributaries, varies from approximately 4 m below sea level in the Polesine sub-region that corresponds to the present delta around the town of Ferrara, to ca. 2100 m at the river's origin in the southern Piedmont province of Cuneo (Pian del Re, Monviso). The Po Valley is crossed by a number of affluents running down from the Alps, in the north, and the Apennines, in the south; some of them are draining lakes of glacial origins (i.e. Lake Maggiore, Como, Iseo, and Garda).

The northern part of the valley is broadly divided into an upper, drier part, often not particularly suited for agriculture, and a lower, very fertile, and well irrigated section. A specific feature dividing the lower plain from the upper part is a geologic feature called the *fontanili* ("spring") line or zone (Muscio, 2002) where the surface water of the mountain streams that tends to disappear underground, spring out again. At present, the Po Valley has a mild continental and a humid subtropical climate. Extensive deforestation and consequent anthropic and natural erosive processes flattened the original low undulations of the natural alluvial landscapes of the Po Valley, nowadays characterized by large extensions of bare, monotonous, flat agricultural landscapes (Sereni and Burr Litchfield, 1997).

Archaeobotanical data derived from pollen and charcoal analyses indicate that northern Italy suffered indeed major deforestation starting from the Bronze Age (Cremaschi, 1983; Nisbet, 2013). The data presently at our disposal, derived from archaeobotany, indicate that most of the Early Holocene landscape of the Po Plain was covered by a thick, deciduous forest. However, anthracological analyses of charred wood samples retrieved from Early Neolithic sites show quite a different picture, with an environment formed by light-demanding trees and essences characteristic of riverbanks and gravelly or sandy soils (Nisbet, 2013). This environment is that typical of the fluvial terraces where the Early Neolithic settlements are located and it has the advantage of providing seasonal pasturage for livestock in an otherwise wooded environment (Bogaard, 2004). The conclusion achieved in a recent synthesis of the anthracological data from the Po Valley suggests that the Early Neolithic sites reflect short-period occupations with a low impact on the local vegetation cover, and a preference for natural, open areas along the watercourses, an ecological environment particularly rich of natural resources (Nisbet, 2013: 10).

3. The chronological frame

Unfortunately, the reliability of the radiocarbon results obtained prior to the introduction of the AMS method is questionable, and many important sites and sequences should be re-dated (Skeates, 2014). This is the case for the radiocarbon dates combining several charcoal species that, among many others, bear the inherent risk of 'old wood effect'. The available data obtained from sites attributed to the Fiorano and Vhò cultural aspects are listed in Table 1 and plotted in Fig. 2, together with a few new unpublished AMS dates, among which are some that therefore were not included in the most recent summary written by M. Pearce (2013).

The high number of different laboratories involved in dating (10) is symptomatic. It clearly shows that the dates do not derive from any planned research strategy. Out of 39 assays, 17 are from four different research laboratories, 20 from five commercial institutions, and 2 from an unknown laboratory. Only 9 measures have been obtained from short life specimens among which are charred wheat or barley caryopses, and 3 are from hazelnut shells. Moreover 21 are conventional and only 18 AMS dates. Ten dates have standard deviations equal or higher than 100 years, which makes them almost useless. In addition, most assays are from unidentified charcoals (22), and 2 from unidentified bone specimens stored for decades in museum collections.

It is evident that the results at our disposal, often derived from unsystematic sampling, provide us with a rather imprecise picture of the chronology of the Early Neolithic settlement of the Po Valley.

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Table 1
Radiocarbon dates from the Early Neolithic sites of northern Italy (*=conventional radiocarbon ages pre-AMS; **=anomalous $\delta^{13}C$ values for terrestrial plants). Calibrations with CalPal online (http://www.calpal-online.de/cgi-bin/quickcal.pl program quickcal2007 ver.1.5).

Site/Culture	Dated material	Lab. n.	^{14}C BP	$\delta^{13}C$	Calendar date BC	References
Piedmont						
Alba-Cooperativa Lavoratori (CN)-Vhó culture	charcoal	GX-20652*	5880±100	–	4754±100	Venturino Gambari, Motella De Carlo, 1995: 271
Alba-Cooperativa Lavoratori (CN)-Vhó culture	charcoal	GX-20845*	6030±80	–	4943±104	Venturino Gambari, Motella De Carlo, 1995: 271
Casalnoceto-Cascina Cascinetta (AL)-Vhó culture	charcoal	Beta-71945*	6340±60	–	5332±77	Padovan et al., 2004: 138
Lombardy						
Isorella (BS)-Vhó culture	charred caryopsis, *Triticum aestivum*	OxA-19737	6183±33	−23.378‰	5137±56	unpublished, S. Colledge, pers. comm., 2010
Isorella (BS)-Vhó culture	charred caryopsis, *Triticum monococcum*	OxA-23133	5850±34	−25.25‰	4413±35	unpublished, S. Colledge, pers. comm., 2010
Isorella (BS)-Vhó culture	charcoal	GrN-23645*	5850±80	–	4435±69	Starnini, 1998: 232
Cecima (PV)-Vhó culture	charred caryopsis, *Hordeum vulgare*	OxA-19803	6240±30	−24.654‰	5220±65	unpublished, S. Colledge, pers. comm., 2010
Cecima (PV)-Vhó culture	charcoal	Har-5123*	5930±130	–	4823±163	Simone, 1987: 474
Ostiano-Dugali Alti (CR)-Vhó culture	Charcoal, *Quercus*, *Fraxinus*	Bln-2795*	6090±100	–	5030±143	Biagi, Nisbet, 1987: 14
Vhó di Piadena-Campo Ceresole (CR)-Vhó culture	charcoal, *Quercus*, *Fraxinus*	I-11445*	6170±110	–	5113±138	Biagi, 1979: 35
Vhó di Piadena-Campo Ceresole (CR)-Vhó culture	charred caryopsis, *Hordeum sativum*	OxA-21358	6122±38	−26.32‰	5094±85	unpublished, S. Colledge, pers. comm., 2010
Vhó di Piadena-Campo Ceresole (CR)-Vhó culture	charcoal, *Quercus*, *Fraxinus*	Bln-3135*	5930±50	–	4816±66	Biagi, Nisbet, 1987: 14
Emilia-Romagna						
Travo-Casa Gazza (PC)-Vhó culture	charcoal	I-13798*	6130±160	–	5058±193	Bernabò Brea et al., 1984: 79
Travo-Casa Gazza (PC)-Vhó culture	charcoal	I-13799*	5830±210	–	4730±241	Bernabò Brea et al., 1984: 79
Fiorano (MO)-Fiorano culture	bone	GrN-19838*	6690±180	–	5628±152	Improta, Pessina, 1998: 109
Fiorano (MO)-Fiorano culture	bone	GrN-19839*	6540±60	–	5503±54	Improta, Pessina, 1998: 109
Fiorano (MO)-Fiorano culture	charcoal	Bln-3137*	5570±50	–	4412±42	Improta, Pessina, 1998: 109
Lugo di Romagna (RA)-Fiorano culture	charcoal	Paris- ? *	5680±260	–	4561±291	Improta, Pessina, 1998: 109
Lugo di Romagna (RA)-Fiorano culture	charcoal	R-2747*	6626±110	–	5567±78	Improta, Pessina, 1998: 109
Lugo di Romagna (RA)-Fiorano culture	charcoal	R-2746*	6161±39	–	5123±65	Improta, Pessina, 1998: 109
Lugo di Romagna (RA)-Fiorano culture	charcoal	R-2748*	6585 ±87	–	5543±64	Improta, Pessina, 1998: 109
Lugo di Romagna (RA)-Fiorano culture	charcoal	Bln-3370*	6170±50	–	5127±71	Improta, Pessina, 1998: 109
Lugo di Romagna (RA)-Fiorano culture	charred caryopsis, *Triticum dicoccum*	OxA-19735	6212±32	−25.072‰	5162±76	unpublished, S. Colledge, pers. comm., 2010
Lugo di Romagna (RA)-Fiorano culture	charred caryopsis, *Triticum dicoccum*	OxA-19736	6213±33	−25.635‰	5166±71	unpublished, S. Colledge, pers. comm., 2010
Savignano (MO)-Fiorano culture	charcoal	Bln-2976*	5880±80	–	4748±101	Biagi, Nisbet, 1987: 14
Savignano (MO)-Fiorano culture	charcoal	I-??*	6310±210	–	5226±225	Improta, Pessina, 1998: 109
Veneto						
Lugo di Grezzana (VR)-Fiorano culture	charcoal	R-2745*	6524±76	–	5478±75	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charcoal	DSH-299	6356±26	−18±1‰**	5342±20	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charcoal	DSA-734	6272±23	−27±1‰	5265±29	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charcoal	DSA-733	6246±24	−18±3‰**	5255±32	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charred shell, *Corylus avellana*	DSH-349	6237±27	−23±1‰	5220±64	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charcoal	DSA-737	6223±56	−33±1‰**	5182±90	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charred caryopsis, *Triticum aestivum/durum*	DSH-300	6217±26	−27±2‰	5169±70	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charred caryopsis, *Triticum* cfr. *dicoccum*	DSH-302	6210±35	−20±1‰	5161±67	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charcoal	DSA-729	6161±22	−31±2‰**	5130±57	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charred shell, *Corylus avellana*	DSA-728	6134±28	−17±1‰**	5109±77	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charred caryopsis, *Triticum/Hordeum?*	DSH-301	6090±41	−39±2‰**	5026±66	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charcoal	DSH-461	5959±48	−43±2‰**	4851±62	Pedrotti et al., 2015: 98
Lugo di Grezzana (VR)-Fiorano culture	charred shell, *Corylus avellana*	DSH-462	5946±24	−22±1‰	4826±27	Pedrotti et al., 2015: 98

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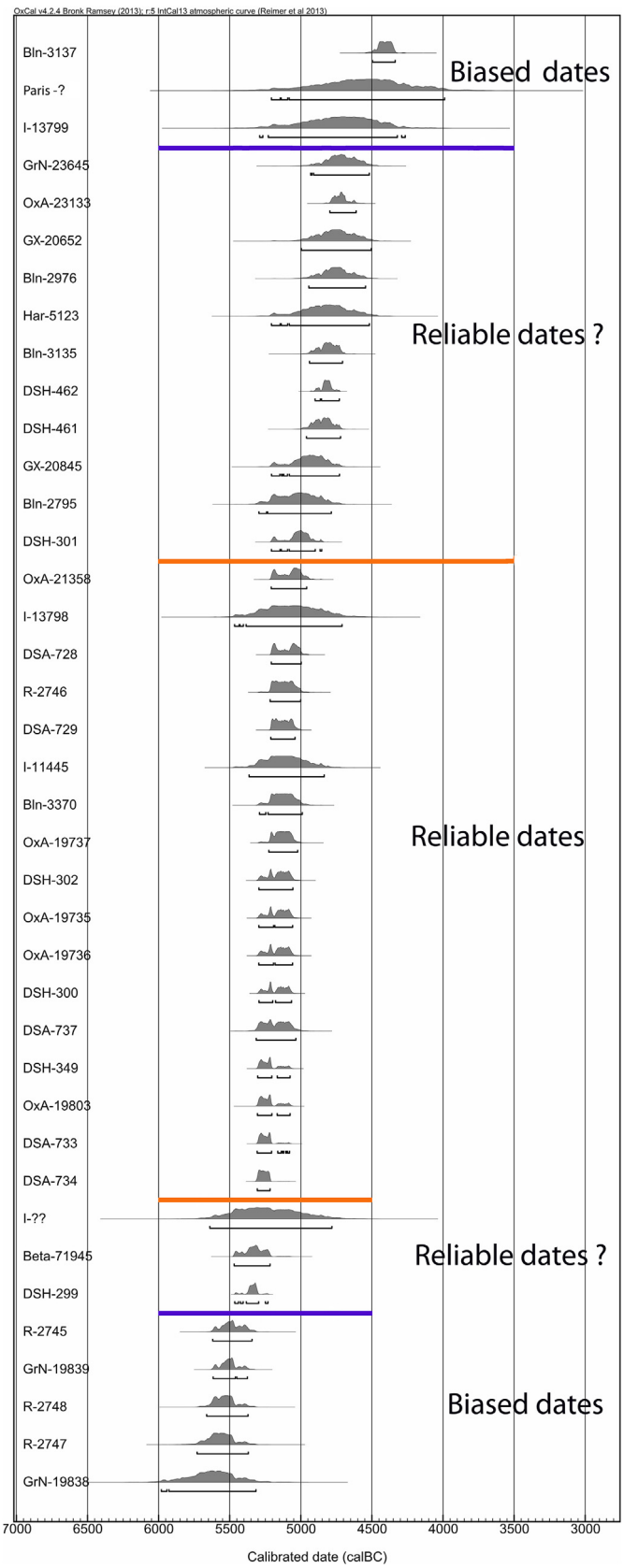

Fig. 2. Plot of the calibrated dates (with OxCal v.4.2.4: BronkRamseyand Lee, 2013; r:5 IntCal13 atmospheric curve: Reimer et al., 2013) available for the Early Neolithic sites of the Po Valley (elaboration by T. Fantuzzi).

Therefore, they hardly define the period the first farmers began to establish settlements in the study region, and the extent of time this period lasted. The dates discussed in this paper show that a well conceived AMS dating program is absolutely necessary to define the role the Po Valley played between the last centuries of the 7th and the beginning of the 6th millennium BP when the Neolithization of northern Italy is supposed to have taken place. According to the results plotted at 1 and 2 σ in Fig. 2, the most homogenous and reliable group of dates shows that the first farmers settled in the plain around the last three centuries of the 6th millennium cal BC. The oldest cluster of dates, between GrN-19838 and R-2745, is most probably unreliable as the gap of ca. two centuries between this latter date and DSH-299 should indicate, while many of those falling within the most recent group of results above OxA-21358 have a far too high standard deviation. However, at present we cannot exclude that some sites continued to be settled up to the first centuries of the 5th millennium cal BC. Moreover at least 7 out of the 13 AMS dates published from Lugo di Grezzana show $\delta^{13}C$ values that are unexpectedly either too high (from −33 ± 1‰ to −43 ± 2‰) or too low (from −17 ± 1‰ to −20 ± 1‰) for C_3 plants (Bowman, 1990: 23), and might create problems of calibration (see Table 1).

Apart from those presented in this paper, two more unpublished AMS dates from one single specimen of sheep/goat bone have recently been obtained from Vhò-Campo Ceresole, Pit XXXII (OxA-X-2504-57 and OxA-27418) within a program of AMS dating of the early domesticates of northern Italy promoted by Cambridge and Cardiff Universities. Both dates fall within the last two centuries of the 7th millennium BP (D. Borić, pers. comm. 2013), and are to be framed in the general pattern provided by the other OxA-dates presented in Table 1 and Fig. 2.

Following the above considerations we can suggest that most sites should be re-dated by AMS, and domesticated animal bones should be processed carefully measuring C:N ratios and subsequently dating only those samples that fall within the accepted ranges for well-preserved collagen on the basis of the quality criteria proposed by G. van Klinken (1999). As recently observed, at the present state of our knowledge, the Early Neolithic sites with conclusive evidence of long period of occupation with sounded ^{14}C-based chronology are very rare, if not absent in the entire Po Valley (Nisbet, 2013: 10).

4. Settlement distribution

The location and distribution of the Early Neolithic settlement of the Po Plain (Fig. 1) have been described in detail already in the 1990s (Biagi et al., 1993a,b). Considering that little step forward has been made during the last 25 years we can confirm that their distribution and preservation conditions vary according to their location either in the northern or southern part of the plain, two territories with quite different physiographic characteristics (Biagi et al., 1993a,b: 66). Broadly speaking, their location follows the general pattern observed for the Early Neolithic sites of southeast Europe, where the villages are systematically constructed along the banks of the most important river courses and their affluents in well-sheltered positions in order to prevent river floods (Nandris, 1970; Biagi et al., 2005: 47).

We have to point out that the Early Neolithic sites of the Po Plain insist over a variety of different soils among which are the perialvear, hydromorphic and clayey soils of the lower plain, north of the river (Cremaschi, 1990; Ottomano, 1998). This variability pattern is reinforced by the discovery of sites of this period also in the gravelly soils of the upper Lombard Plain, close to the pre-Alpine spring zone foothills (Starnini et al., 2004: 58).

Conservation conditions of the sites in the northern part of the

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Fig. 3. Distribution map of the Early Neolithic cultural groups of northern Italy and the location of the main raw material sources. 1 Primary sources of High-Pressure (HP) Metaophiolites employed for polished stone tools; 2 Oligocene conglomerates containing HP Metaophiolites.

Plain contrast with those of the territory south of the Po River. Here many sites are buried by meters of colluvium, while others are exposed on the surface by soil erosion, as systematically recurs in the northern part of the plain where the sites are usually well visible from the surface (Barker et al., 1987: Fig. 2). In effect the southern part of the Po Plain is more suitable to the preservation of prehistoric settlements. This is demonstrated also by the discoveries made around the middle of the 19th century (Chierici, 1877–78), which have been recently reconfirmed by the results of the excavations carried out at Lugo di Romagna in the late 1900s (Degasperi et al., 1998). Also in this part of the Plain Early Neolithic sites are distributed along the banks of the terraces of the most important watercourses flowing from the Apennines (Biagi, 1995b: 290).

5. Where did they live and where did they die?

The Neolithic archaeology of northern Italy was centered for more than a century on the problem of the so-called "hut floor foundations" or *fondi di capanna* in Italian (Malavolti, 1953; for a discussion see Barfield, 1972). Groups of pits of different size and shape began to be discovered already during the second half of the 19th century in both Emilia and Lombardy, and soon after their excavation started (Chierici, 1875b; Parazzi, 1890; Castelfranco, 1892). These structures were later attributed to two slightly different though partly interfering cultural aspects, namely Fiorano (Malavolti, 1953), whose distribution covers respectively the eastern part of the Po Valley, corresponding to Emilia, the Veneto and north-western Tuscany regions, and Vhò (Bagolini and Biagi, 1975) in Lombardy, part of Piedmont and western Emilia (Bagolini and Biagi, 1977) (Fig. 3). These two cultural aspects, named after their eponymous sites identify the Early Neolithic of the Po Valley and are defined on the basis of their pottery forms and decorations also as groups or *facies* (Pearce, 2013: 159).

Unexpectedly most of the Italian archaeologists still maintained the interpretation of these refuse and multi-function pits (Cavulli, 2006; Pearce, 2008; Cattani, 2009; Miret i Mestre, 2015: 39) as habitation structures until the middle of the 1990s (Giannitrapani et al., 1989; Tiné, 1993; de Marinis, 1995: for a critical review see Biagi, 1995a: 107) despite the evidence provided by other Early Neolithic sites excavated in central-eastern Italy (Tozzi and Zamagni, 2003).

Though our knowledge of the Early Neolithic dwelling structures of northern Italy is still poor (Robb, 2007: 77), evidence of their existence has been revealed by the excavations carried out at Lugo di Romagna, a Fiorano culture settlement located in Emilia-Romagna (Fig. 1, n. 15) along the northern foot of the Apennines (Degasperi et al., 1998), in a region from which, as mentioned above, the occurrence of prehistoric sites at present buried by meters of colluvial sediments is known since more than a century (Chierici, 1877–78; Biagi et al., 1993a,b).

With the exception of Lugo di Romagna we know very little of the spatial organization, general size and topography of the Early Neolithic villages of northern Italy (Cavulli, 2008: 39). Moreover, at present we do not have any evidence for burial practices for the same period. The absence of cemeteries of this age challenges and prevents us from the possibility of inferring important aspects of the social structure and settlement organization of the first Po Plain farmers. Furthermore most of the excavations have been carried out over limited extensions, and most of the excavated structures consist only of pits of different size, shape and depth. Cylindrical water wells are also known, which deepen down well below the water table (Bagolini and Biagi, 1975: 39).

The post-Neolithic land uses, together with extensive

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deforestation and other natural erosive processes progressively changed and flattened the original, natural undulations of the alluvial landscapes of the Po Valley and its tributaries. In many cases they totally erased the original Neolithic trampling surface. This fact is well known from the evidence provided by the sites distributed north of the Po River course (Biagi et al., 1993a,b), whilst many of those located in the southern part of the valley have been progressively buried under meters of colluvium, as the case of Lugo di Romagna shows (Barker et al., 1987).

Due to the aforementioned process of long-term anthropogenic, systematic reassessment of the landscape, only a handful of particular cases survived (Cavulli, 2008), two of which were excavated over a surface wide enough to yield structural remains: 1) Lugo di Romagna (Ravenna) (Fig. 1, n. 15), where traces of a wooden palisade surrounding the Neolithic village and the ruins of a burnt house have been preserved thanks to the thick alluvial cover that buried the site, and subsidence phenomena in the area, and 2) Lugo di Grezzana (Verona) (Fig. 1, n. 13), which was buried by colluvium derived from the erosion of the slopes surrounding the site (Pedrotti et al., 2000, 2015). A third probable structure was discovered at Vhò, Campo Ceresole (Cremona) (Fig. 1, n. 8); it consists of a long and straight, narrow canal with a wavy profile, most probably the remains of a palisade made of wooden poles (Bagolini et al., 1987; Fig. 1).

However, putting together the available sparse data, we can suggest that the earliest Neolithic north Italian villages consisted of short, rectangular, wooden framed and posted houses, and the villages were most probably surrounded by ditches delimited by palisades, a schema not very different from those known from other areas of south-eastern and central Europe (Mazurié de Keroulain, 2003). Underground pits of various shape and dimension are to be interpreted as clay pits, which were later turned into rubbish pits, and as post-holes and other dwelling infrastructures, deeply eroded at their top by thousand years of post-Neolithic intensive cultivation, including Roman Age centuriation, Middle Age Benedictine convex shaping of fields, and, finally, modern deep-ploughing (Sereni and Burr Litchfield, 1997). The time elapsed between the moment in which pits were dug, and later utilized, and the time they were abandoned, decayed and then filled up, has been inferred in some cases thanks to geoarchaeological analyses (MacPhail, 1995; Ottomano, 1998; Perini et al., 2001) and experimental replicas (Cavulli, 2008).

In other regions of northern Italy, Early Neolithic occupations are known mostly from caves and rock shelters that open along the coast and inside the inner valley karstic landscapes. This is the case for Liguria (Fig. 1), a complex territory whose landscape is rough, mountainous, deeply incised by short torrents, whose Neolithisation process is attributable to a Tyrrhenian aspect of the Impressed Ware culture (Biagi and Starnini, 2016a). Open air sites did undoubtedly exist also in this region, as shown by a few clues, though in fact they are at present elusive (Starnini and Vicino, 1993; Capelli et al., 2007). This complex territory is affected by Holocene sea-level changes, strong erosion of the slopes caused by repeated deforestation, and consequent alluvium/colluvium accumulation along the valley bottoms. Furthermore, the coast strip greatly suffered for intensive and uncontrolled urbanization mainly during the last two centuries.

Recently, an AMS radiocarbon result (MAMS-11443: 5178 ± 25 BP) reassessed the chronology of the only human burial previously incorrectly attributed to the Early Neolithic Impressed Ware culture of Liguria on the basis of its alleged stratigraphic location within the Arene Candide Cave sequence. The burial was discovered during the excavations carried out in the 1970s. The date definitely attributes the burial to a late phase of the Neolithic (Biagi and Starnini, 2016a: 39). The absence of Early Neolithic human remains all over Northern Italy, not only makes the study of the human populations of this period impossible, but also prevents us from any eventual comparison with those of the Late Mesolithic, which in our case is represented exclusively by the burial recovered from the high-altitude site of Mondeval de Sora in the Veneto region (Alciati et al., 1994).

To sum up, topics of major interest such as funeral practices, social structure, spatial organization of the villages and settlement pattern are still almost unknown due to scarcity of archaeological data. The only exceptions are a few evidences of symbolic practices, among which are deposition of objects and artifacts in special places, in some case interpreted as foundation rituals (Cavulli, 2008; Pedrotti et al., 2015), and the occurrence of anthropomorphic clay figurines from a few sites (Ostiano-Dugali Alti, Vhò-Campo Ceresole, and Alba-Borgo Moretta: Biagi, 1996). They were

Fig. 4. Isorella (Brescia), Pit 1 during the 1997 excavation (photograph by E. Starnini).

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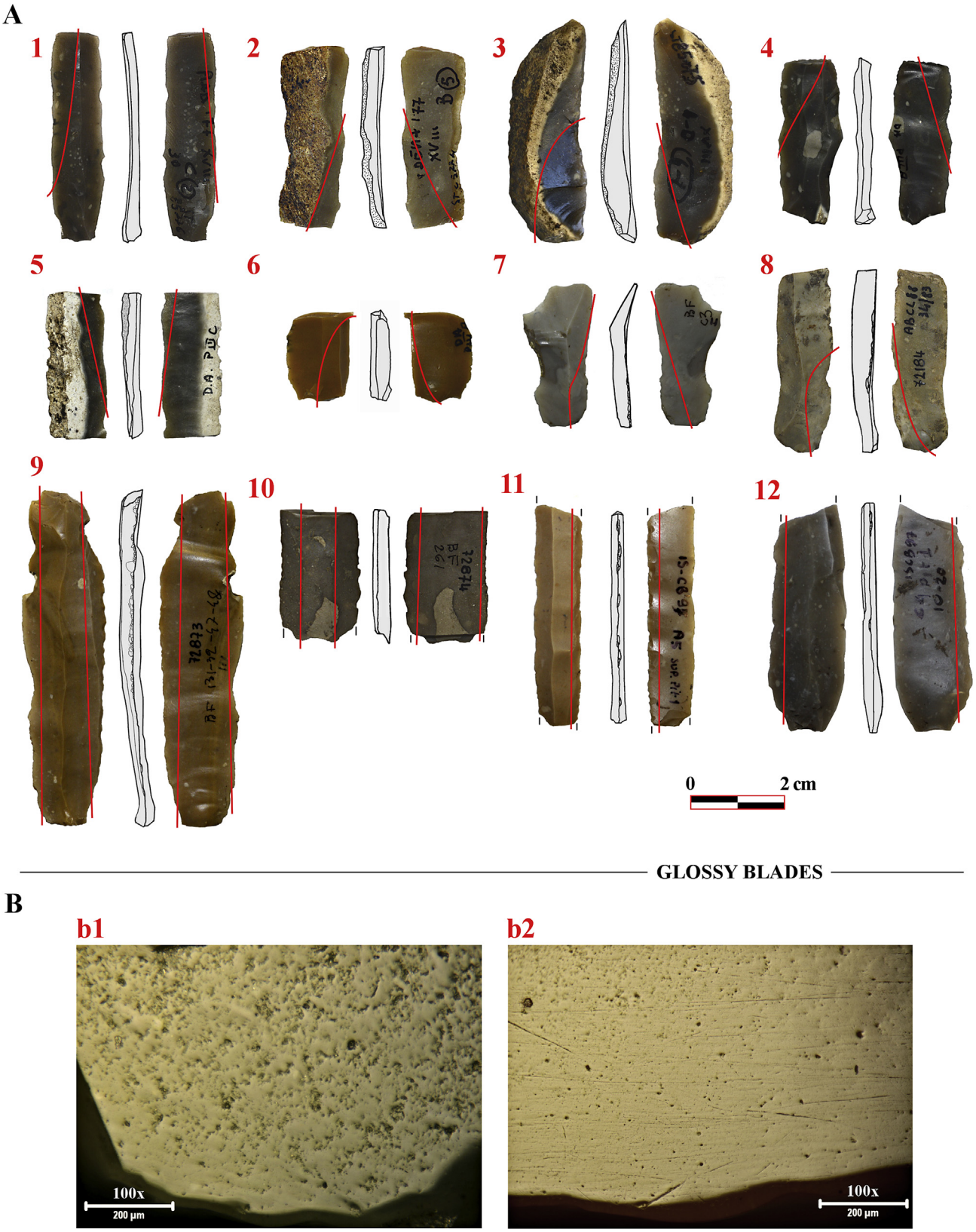

Fig. 5. A) Glossy blades from Vhò culture sites. With a diagonally distributed gloss: 1–3 Vhò-Campo Ceresole; 4–6 Ostiano-Dugali Alti; 7 Brignano Frascata; 8 Alba. With a parallel distributed gloss: 9–10 Brignano Frascata; 11–12 Isorella. B) Use-wear traces from Ostiano-Dugali Alti – b1: plant polish showing domed and smooth surface; b2: cereal polish showing a flatter and more abraded surface (photographs by N. Mazzucco).

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always retrieved from rubbish pits, perhaps showing evidence of "*informal ritual performed around the household*" (Robb, 2007: 48; see also Steffens, 2016:142–144), or "*structured depositions*" (Pearce, 2008).

6. The origin of the Neolithization process in northern Italy

Northern Italy is one of the many countries that fall into the general debate that affected for long the archaeological literature, between diffusionists, indigenists, and the followers of the more recently proposed arrhythmic model (Guilaine, 2000; Berger and Guilaine, 2008; Van der Linden, 2011). To make an example, some of the researchers who worked on the Neolithisation process of Liguria believe that Castelnovian, Late Mesolithic hunter-gatherers played a certain role in the earliest Neolithic way of life in the region ("*Castelnovien néolithisé*": Binder and Maggi, 2001: 413, Fig. 1). However, the evidence claimed to support the aforementioned hypothesis is based mainly on old, ambiguous coincidence finds that were collected by local amateurs more than 30 years ago. They consist of a bunch of potsherds recovered near Suvero (Maggi, 1979–80 ,1983), a village in the eastern Ligurian Apennine at ca. 700 m of altitude (Fig. 1, n. 20), located in a region from which any other Neolithic evidence is still missing after ca. 40 years of research. The chipped stone assemblage recovered during the excavations that followed, and the other surface finds, remain substantially unpublished. Later they were given the name of "*facies Pianaccia*" (after the eponym site Pianaccia di Suvero).

Though undated, because of the absence of any organic remain, and inconsistent from a stratigraphic point of view, Suvero is still paradoxically considered by some authors an eponymous type-site. Invoking alleged stylistic affinities with the aforementioned bunch of potsherd, archeologists grouped under its umbrella several, heterogeneous complexes, whose distribution covers a large territory, spanning from Emilia-Romagna to the Veneto (Ferrari and Steffé, 2006; Tiné, 2015: 84). The available data strongly contrast with the summary view recently proposed by A. Ferrari and Steffé (2006: 91, Fig. 6), which is not supported either by the radiocarbon chronology, or the material culture remains. The above statements show how inconsistent has been in some cases the methodology of study of the Neolithization process in contrast with what a scientific approach would logically require (Zilhão, 2011).

Other researchers who pointed out the present elusive evidence of Late Mesolithic human peopling in the entire Po Plain (Biagi et al., 1980; Ferrari and Fontana, 2016) from which so far we do not have any evidence for *in situ* Castelnovian sites and their related radiocarbon dating, more convincingly interpret the Neolithization of northern Italy as due to demic diffusion (Biagi, 2003a; Tiné, 2015: 84). The same conclusions have been drawn considering our far-too-poor knowledge of reliable Late Mesolithic complete sequences and their detailed absolute dating (Skeates, 2003) that nevertheless, wherever they exist, in the Alpine Trentino region for example, or the Trieste-Slovene Karst, systematically show a gap of some 1000 years between the Late Mesolithic Castelnovian and the above-lying Early Neolithic occupation layers (Biagi and Spataro, 2001; Perrin, 2005; Forenbaher and Miracle, 2014b: 126). Furthermore, the analysis of sites distribution (Biagi, 1991), and settlement pattern (Biagi, 2001) is prevented since most of the late Mesolithic sites are represented by small surface collections of finds and single, characteristic, Castelnovian implements, mainly trapezes (Franco, 2011). In this respect it is important to point out that the few available Late Mesolithic Castelnovian dates come either from Alpine and Apennine sites, or from Trieste and Slovene Karst locations (Baroni and Biagi, 1997: 78). The above considerations follow the general trend available from the entire south-eastern Europe (Biagi and Starnini, 2016b), which show how little our knowledge has improved during the last 60 years (Clark, 1958).

7. Subsistence economy

The advanced cereal agriculture practiced by the Early Neolithic villagers of the Po Valley is inferred by both the lithic tool-kit that comprises sickle inserts and querns, and especially charred seeds represented by different species of domestic pulses (Rottoli and Castiglioni, 2009).

A pilot project was promoted at Isorella, an Early Neolithic Vhò site of the central Po Plain, located ca. km 27 south-southeast of Brescia (Fig. 1, n. 9), where one large shallow pit, 30 cm deep, covering ca. 20 sqm, was excavated in 1997 (Fig. 4). The whole blackish soil filling the pit was carefully water-sieved at 0.5, 1 and 2 mm. meshes (Starnini, 1995; Starnini et al., 2000; Perini et al., 2001). Thanks to this method, it was possible for the first time to recover evidence of cultivation of four domesticated cereal species (barley, wheat, bread wheat: *Hordeum* and *Triticum monococcum, T. dicoccum, T. aestivum*) recurring together within the same settlement structure. Two charred caryopses were AMS dated from the above pit (Table 1 and Fig. 2). One *Triticum monococcum* specimen yielded a slightly too recent result for an Early Neolithic Vhò site of the Po Valley (OxA-23072: 5850 ± 34 BP). It roughly coincides with the beginning of the Middle Neolithic Square-Mouthed Pottery culture period in northern Italy, though no find of this latter aspect was ever recovered during excavation. The second assay (OxA-19737) from a *Triticum eastivum* caryopsis yielded the result of 6183 ± 33 BP that seems more appropriate for the material culture assemblage retrieved from the structure (Table 1 and Fig. 2). This date is in a good agreement with a new AMS date from Cecima (OxA-19803: 6240 ± 30 BP), a Vhò culture site excavated along the Apennine foothills of south-western Lombardy (Fig. 1, n. 3), obtained from a charred caryopsis of barley recovered during the excavations of a rubbish pit, incorrectly interpreted as a hut foundation (Simone, 1987), as well as from that from a *Hordeum sativum* caryopsis from Pit XVIII at Vhò-Campo Ceresole (OxA-21358: 6122 ± 38 BP).

An indirect proof of agricultural practices that are nevertheless still too poorly known from an archaeobotanical point of view (Rottoli and Castiglioni, 2009), has been obtained by the traceological analysis of the chipped stone implements. Sickle blades are, indeed, one of the most characteristic tools of the north Italian Neolithic assemblages (Figs. 5, 1–11). From Ostiano-Dugali Alti (Fig. 1, n. 7), Vhò-Campo Ceresole (Fig. 1, n. 8), Alba (Fig. 1, n. 1) and Brignano Frascata (Fig. 1, n. 4) several glossy blades have been recently re-examined. They all are of a rather small dimension, with a diagonal gloss covering one of the two edges. These tools were used for crop harvesting, hafted diagonally as part of a composed sickle, probably similar to the specimens inserted in the wooden sickle from La Marmotta (Central Italy) (Fugazzola Delpino et al., 1993) or the Karanovo culture sites of Bulgaria (Gurova, 2014). However, as already pointed out by N. Mazzucco et al. (2016), other glossy blades from Isorella and Brignano Frascata show that also other modes of hafting were in use, with blades inserted parallel to the handle (Figs. 5, 12–15). These latter might be related to a different type of reaping tool.

Moreover, as already noted by B.A. Voytek (1995), a certain variability within the species of harvested plants probably existed. Microscopic textural characteristics of sickle gloss can be used to recognize different species of plants, harvested at different stages of maturity (green or ripe) (Fig. 5, B, b1-2). Some sickle tools show a flatter and more abraded polish, while other a domed and smooth polish suggesting that sickles were used not exclusively for cereals, but possibly to gather other herbaceous plants (Fig. 5, B). The presence of tools associated with the processing of vegetal fiber

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(see below paragraph 8) confirms that basketry activities and wood crafts were also part of the Neolithic subsistence economy.

The data currently available for the reconstruction of the meat diet of the Vhò and Fiorano villagers is rather scarce. For instance, only 17 of the 69 pit structures excavated at Vhò-Campo Ceresole yielded identifiable bones, 6 only of which contained most of the finds (Barker, 1983), while very little is known of the Fiorano sites that were excavated between the middle of the 1800s and 1950s. The high percentage of wild animal bones retrieved from the two above Campo Ceresole pits (number XVIII and XXXII respectively) have been suggested to result from "the structured deposition" of feasting remains (Pearce, 2008: 23), though the evidence from a few almost contemporaneous LBK sites in Germany show a highly variable percentage of wild animal bones, spanning from 100% to 39% according to their occurrence from different pits related to the same house structure (Cziesla, 2015: 258, fig. 226). Hence, prudence in interpreting evidence must be evoked until more data from extensive excavations of village structures will not be available.

A summary of the information available from the researches conducted during the 19th century at the Vhò sites has been provided by B. Bagolini and Biagi (1975: 40). However, thanks to the data retrieved from the excavations carried out mainly in the 1970s, we can assume that the Vhò farmers practiced animal breeding and exploited both wild and domestic animals for meat consumption (Barker, 1983; Barker et al., 1987). Archaeozoological data from the study of the animal bone assemblages revealed that the subsistence economy of Ostiano-Dugali Alti and Vhò-Campo Ceresole, two riverside sites in the midst of woods and marshes, was closely adapted to the resources and constraints of the local environment. According to the limited available evidence, the meat diet of the villagers was most probably based mainly on hunting wild animals, whilst sheep and goats played a minor role, together with fishing and the collection of freshwater mollusks and pond turtle.

A different picture comes from Isorella. The excavations carried out at one single pit yielded a rich bone assemblage, with ovicaprid and pig bones prevailing in terms of MNI, followed by cattle (Bon et al., 2005). Regarding the wild species, the most commonly hunted animal is red deer, followed by roe deer and wild boar. The exploitation of resources that characterize the rich environment of the spring line and rivers surrounding the site is also documented by the presence of freshwater mussels (*Margaritifera auricularia*) and pond turtle (*Emys orbicularis*) (Starnini et al., 2000; Bon et al., 2005). These data are important not only for the reconstruction of the early subsistence economy and animal husbandry, but also for the reconstruction of the natural environment of the central Po Valley during the Early Neolithic period.

8. Material culture remains

Regarding the ceramic and lithic production, if we exclude the inner Alpine regions, the Early Neolithic of northern Italy can be divided into three main macro areas: the first corresponds to the Impressed Ware culture of the Ligurian coast (Bernabò Brea, 1950, 1956; Biagi and Starnini, 2016a), the second to the Impressed Ware culture of the Adriatic coast, whose eastern stream saw the later spread of the Dalmatian Danilo culture into the Trieste-Slovene Karst and eastern Friuli (Biagi et al., 1993a,b; Spataro, 2002; Biagi, 2003b; Biagi and Spataro, 2005; Forenbaher and Miracle, 2014a), the third to the Po Plain Early Neolithic, represented by the Fiorano and Vhò cultural aspects (Bagolini and Biagi, 1977).

The first attempt to define the Early Neolithic of northern Italy resulted from a systematic research program promoted by the late B. Bagolini and P. Biagi. It was carried out between the 1970s and the early 1980s (Bagolini, 1980; Bagolini and Biagi, 1980), following the new impetus given by L.H. Barfield, who was the first to undertake a research on the topic after the end of World War II (Barfield, 1971, 1972). This project resulted in the preliminary definition of several cultural groups, named after their eponym type-sites, their material culture remains, suggesting their chronological attribution and eventual interrelations between them, characterizing the earliest food producing communities of different

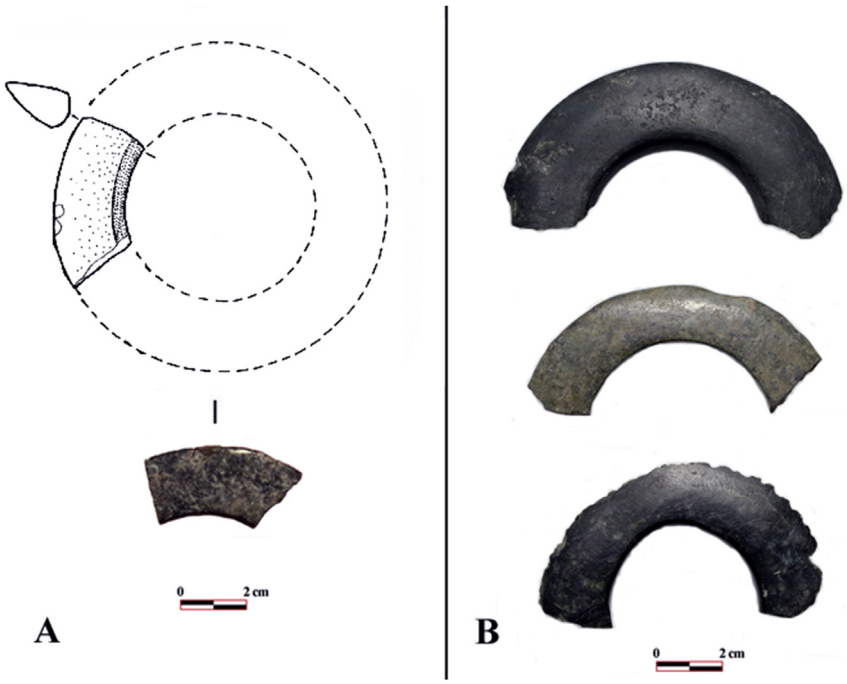

Fig. 6. Polished greenstone arm rings of the Early Neolithic sites of the Po Valley: A) fragment of serpentinite bracelet and its reconstruction drawing from Isorella, Vhò culture. B) bracelet fragments from Fiorano-Fornaci Carani, Cava Est, mid-20th century excavations, Fiorano culture.

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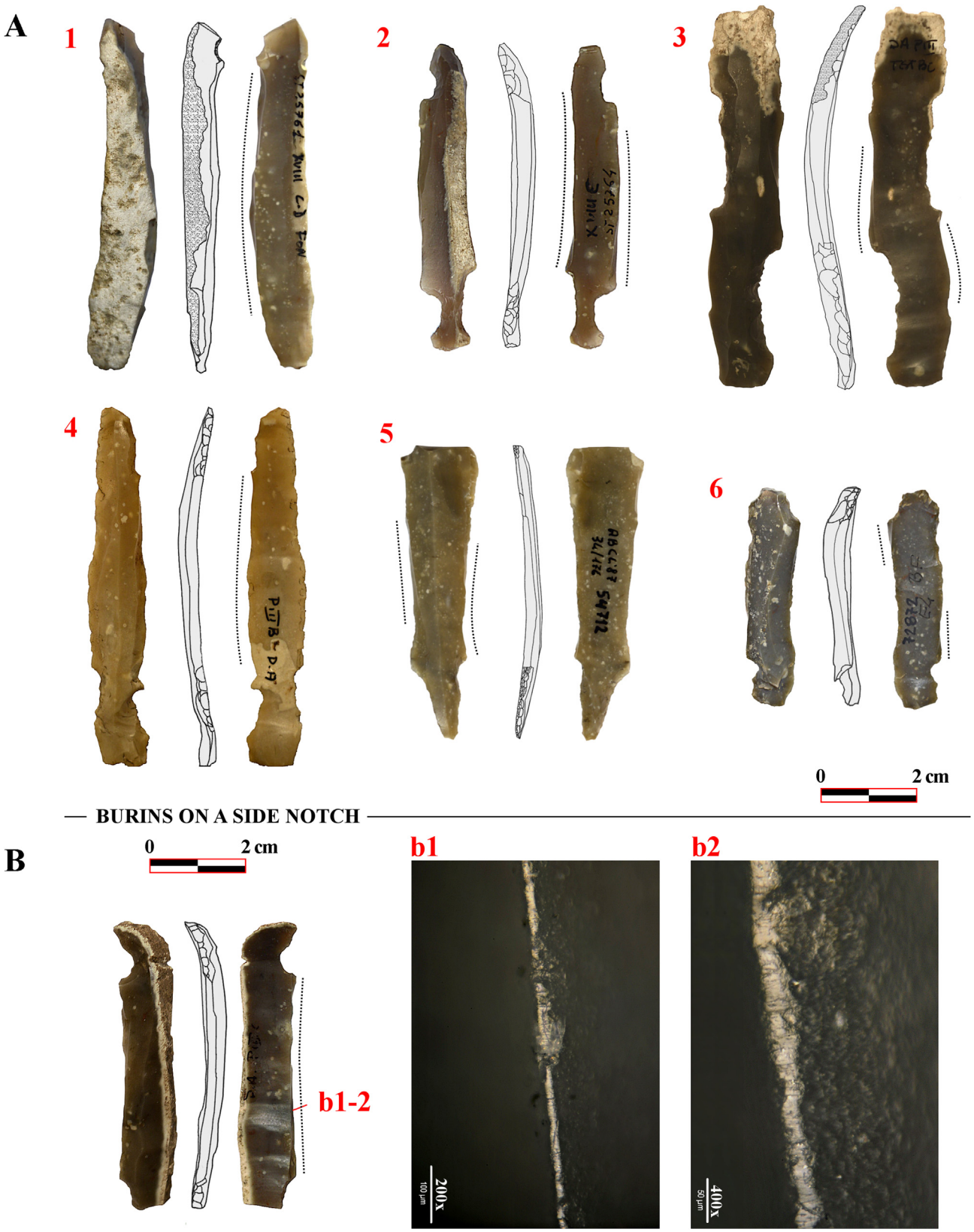

Fig. 7. A) Burins on a side notch from Vhò culture sites: 1–2 Vhò-Campo Ceresole; 3–4 Ostiano-Dugali Alti; 5 Alba; 6 Brignano Frascata. B) Burin from Ostiano-Dugali Alti showing use-wear on the burin; b1-2) antler/bone bevel, with striations and scratches and edge-damage (photographs by N. Mazzucco).

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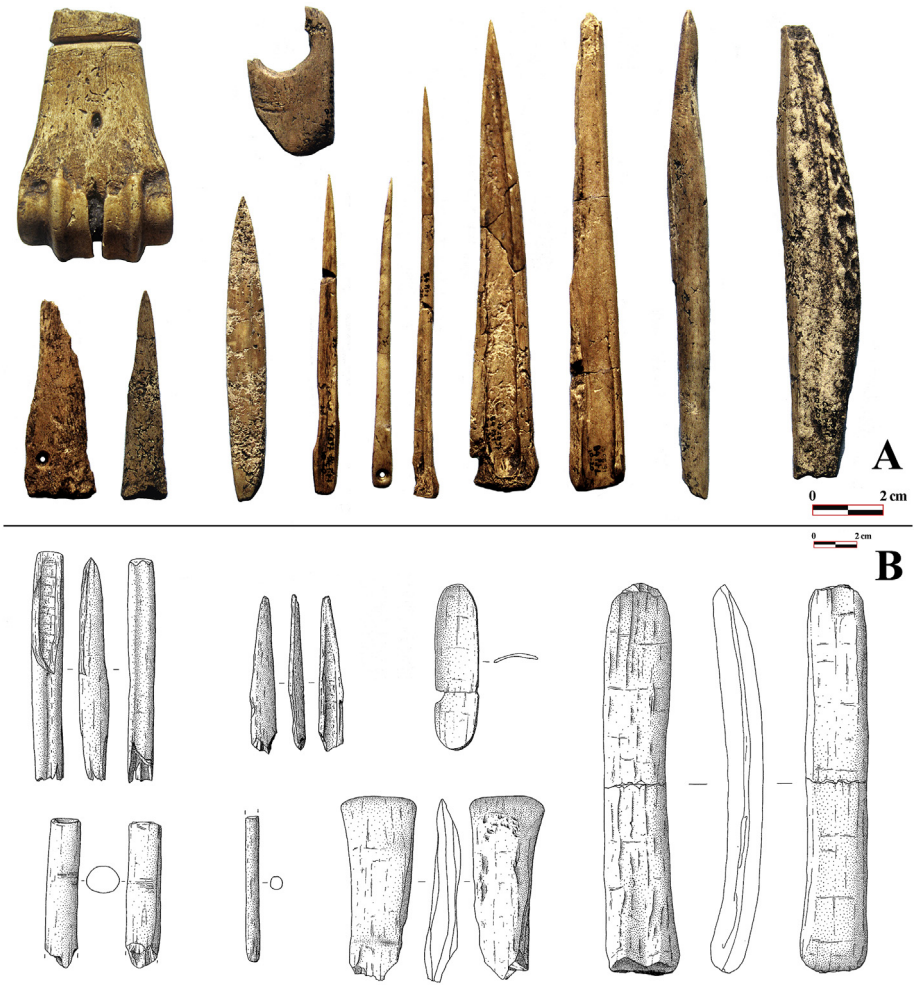

Fig. 8. Bone and antler tools from Early Neolithic sites of the Po Plain. A) from Isorella, excavations 1997, Vhò culture. B) from Fiorano-Fornaci Carani, Cava Est, mid-XX century excavations, Fiorano culture (photographs by E. Starnini).

regions, among which are those of Fiorano, Vhò, Gaban, Fagnigola etc. (Fig. 3). This oversimplified preliminary assessment was structured as a schematic, rather artificial subdivision to fulfill the emptiness and backwardness into which the Italian Neolithic studies had dropped after the 1950s, though it had never been conceived by the aforementioned authors as a rigid, static model to be uncritically applied to the different chrono-cultural aspects and sites, as in effect happened especially after the 1990s.

Pottery typology apart, in recent years much interest has focused on the analysis of the chipped stone assemblages. A first attempt to define the typometry and lithometry of the Early Neolithic chipped stone assemblages of the region was made in the 1980s (Bagolini and Biagi, 1987). More recently some archaeologists began to work on the lithic industries, focusing not only on typology and technology, but also on traceology (Biagi and Voytek, 1990–91; Fasani et al., 1994; Voytek, 1995; D'Amico et al., 2000) and raw material sourcing (Barfield, 1987; D'Amico and Starnini, 2006; Goldenberg, 2006). According to the results achieved by the aforementioned researches the raw material employed for the manufacture of the chipped stone implements is the Biancone and Scaglia variegata flint of the Venetian Pre-Alps sources (Barfield, 1994, 2000; Bertola, 2016) frequently referred in the archaeological literature also as "Monti Lessini flint" or "Alpine flint". Other lithotypes have been utilized for the production of polished greenstone tools (adzes/axes, and more rarely chisels) and ornaments (arm rings) (Fig. 6). According to the results achieved thanks to archaeometric analyses we know that their geological provenance is located in the western Alpine arc, where two main primary sources of high pressure-metaophiolithes are known, with their wide secondary deposits, namely the Monviso in Piedmont and the Voltri Group in Liguria (D'Amico et al., 2004; D'Amico and Starnini, 2006).

As far as concerns the tool-kit of the earliest farmers of the Po Valley, several chipped stone tool-types were recognized. They are mostly obtained from blades and bladelets obtained from cores of Biancone and Scaglia variegata Lessinian flint gathered as pebbles from the secondary deposits of the Lake Garda moraines (Barker et al., 1987: 112). Obsidian use is so far unrecorded. Perforators, geometrics (scalene trapezes and rhomboids), sickle blades and blades with a sinuous semi-abrupt retouch are some of the most recurrent tools (Biagi and Nisbet, 1987a; D'Amico et al., 2000).

Among them, one of the most typical element of the north Italian Early Neolithic assemblages is a unique type of Burin on a side notch, otherwise called "Ripabianca Burin" (Fig. 7, A). Its characteristics were defined for the first time from the late Impressed Ware site of Ripabianca di Monterado in the Marche region of Central-eastern Italy (Broglio and Lollini, 1963; Guerreschi, 1972), an open-air site whose radiocarbon chronology interestingly falls within the last three centuries of the 7th millennium BP (from R-599a: 6260 ± 85 BP to R-598a: 6140 ± 70 BP:

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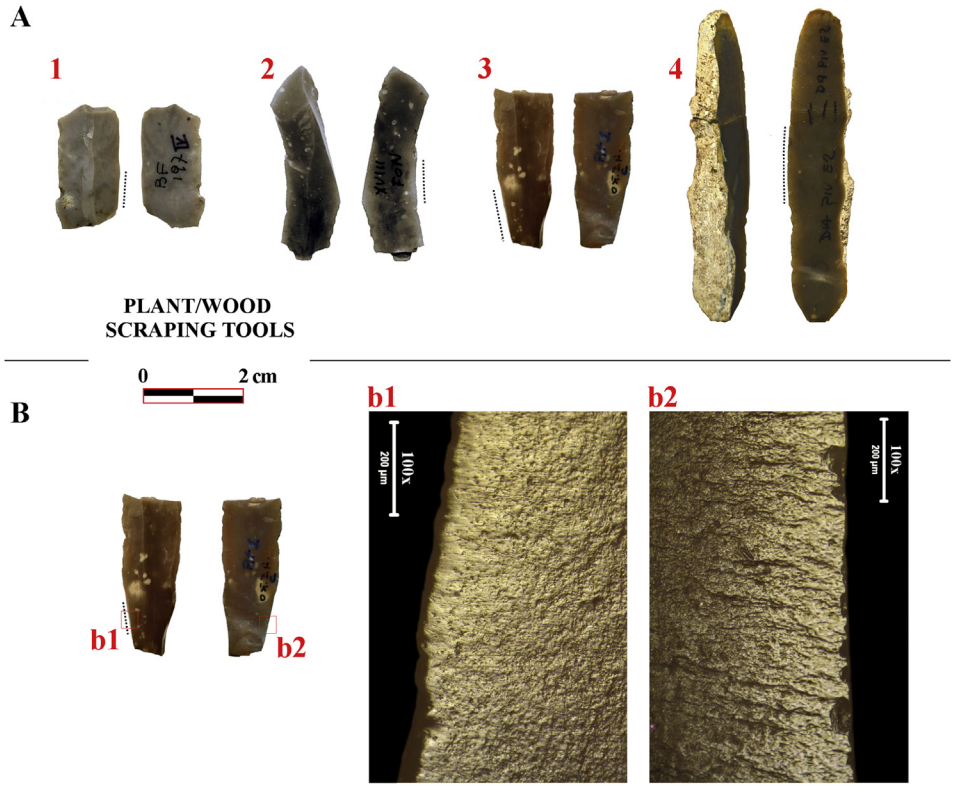

Fig. 9. A) Tools used for plant/wood processing tasks from Vhò culture sites: 1 Brignano Frascata; 2 Vhò-Campo Ceresole; 3 Brignano Frascata; 4 Ostiano-Dugali Alti. B) Blade from Brignano Frascata used for plant/wood scraping; b1-2) plant polish, flatter and more abrasive on the dorsal face, smooth and greasy on the ventral face (photographs by N. Mazzucco).

Alessio et al., 1970: 603).

A recent traceological analysis of the Ripabianca burins recovered from several Vhò culture sites highlighted the technological and functional standardization of these tools. Previous studies based on the analysis of macroscopic wears, interpreted the burins as resulting from resharpening, more precisely to rejuvenate tool edges (D'Amico et al., 2000: fig. 10). According to the above interpretation the functional part of the tool were the retouched notches (Voytek, 2014).

Nevertheless, new analyses based on a high-magnification observation of their surfaces through reflected-light microscopy suggest that the Vhò culture sites burin blows were deliberately made to obtain abrupt edges that were later used for scraping activities. Therefore, the notches were not used for scraping tasks, but were related to the production of the burin spall, and possibly the hafting of the tool, as previously suggested by F. d'Errico (1987). The reason for breaking the long edge by burin blow – therefore losing its cutting propriety – is that in this way a breakage-resistant 90° edge is obtained, which is very suitable for scraping hard materials. After the first use, a second burin blow is occasionally made to resharpen the edge. In most of the cases the second blow is made at the opposite edge.

From an economic point of view, the above tools were for long associated with plant or wood processing activities. A first interpretation by F. d'Errico (1987), based on SEM observation, hypothesizes their utilization for separating ears from straw. In contrast, B.A. Voytek (1995, 2014), studying their macro-wears patterns, suggested that they were used mainly for wood-working. However, both interpretations are questionable. The traces observed on most of the Vhò sites burins from Brignano Frascata, Vhò-Campo Ceresole, Ostiano-Dugali Alti and Alba, resemble those experimentally reproduced for bone/antler scraping, more than wood or plant working. The main difference consists in the limited extension of the wears, which forms a rather flat bevel on the lateral edge of the burin, little penetrating into the ventral or dorsal surface, and the higher number of striations, scratches and micro-cracks within the polish itself (Fig. 7, B).

If one compares the use-wear traces of the Vhò burins with those from the Chasseen (Gassin et al., 2006), attributed to the end of the 5th and beginning of the 4th millennium cal BC, extensively used for plant and wood processing, it is evident that those from Vhò were used to perform different tasks. We have to keep in mind that distinguishing between wood- and bone-scraping polishes is not always easy because of the overlap between polishes as demonstrated also by recent blind tests (Gassin et al., 2012). In our view the importance of bone craft activities within the Po Plain

Fig. 10. *Antalis dentalis* and *Columbella rustica* specimens from Isorella, Vhò culture (photographs by E. Starnini).

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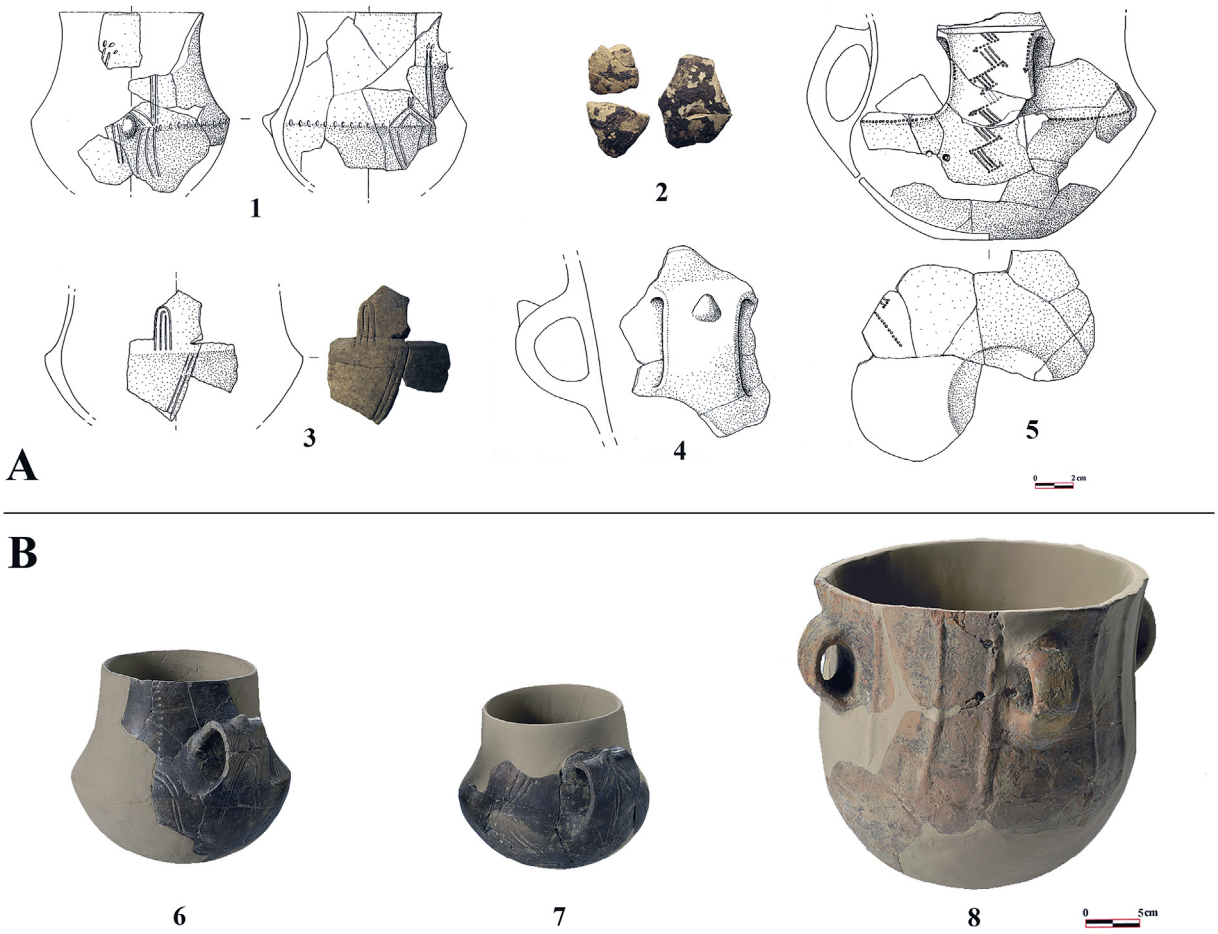

Fig. 11. Pottery forms and decorations of the Vhò (A) and Fiorano (B) cultures. A) 1, 3–5 handled cups and vessels fragments; 2 potsherds of *figulina* ware, from Isorella, excavations 1997. B) 6–7 characteristics handled cups and jar (8) from Fiorano-Fornaci Carani, Cava Est (drawings by E. Starnini).

Neolithic sites so far has been underestimated, most probably because of the low rate of preservation of organic material, among which are bone tools. Where bone and antler implements have been found, for instance at Isorella (Starnini et al., 2000; Bon et al., 2005) and some other Fiorano and Vhò culture sites (Bazzanella, 2000), they show significant evidence of a rather sophisticated bone handicraft, including needles (Fig. 8). Moreover, some tools related to plant and wood scraping tasks have been detected also within the Vhò assemblages. In this latter case unretouched blanks were chosen, mainly blades and blade fragments, often employing natural abrupt edges (Fig. 9, A-B).

Another point to remark is the technological standardization of the Ripabianca burins. Given the hardness of the worked material, thick blanks (averagely between 4.4 and 5.6 mm) were chosen to produce the tools. This shows why most of the Ripabianca burins from the Po Plain sites are made on cortical blades or blades obtained from the rejuvenation of the flaking surface, which are the thicker products (or by-products) of the entire reduction sequence. This remark apart, burins on a side notch should be really regarded as formal tools typical of the north Italian Early Neolithic, because of their technological and functional standardization, and their recurrence within all the lithic assemblages, from Piedmont to the Veneto. With the exception of Ripabianca di Monterado in the Marche, they are absolutely unknown either from the neighboring regions, or the north Tyrrhenian Impressed Ware sites. Moreover, bone/antler scraping tools are rarely represented by such a standardized tool-type and in such high percentages within the Early Neolithic lithic assemblages of Mediterranean Europe (Gassin et al., 2006; Mazzucco et al., 2015; Mazzucco and Gibaja, 2016). Further experimental work is necessary to better define their hafting mode as well as their subsistence economic significance.

Besides bone and antler tools, marine shells have also been used for handicrafts, mainly transformed into personal ornaments. For instance, one *Spondylus* bead was recovered from Ostiano, Pit I (Biagi, 1995a: 96). Moreover, one fragment of *Spondylus* bracelet was identified among the assemblage recovered during the excavations conducted by F. Malavolti at Fiorano Modenese (Starnini et al., 2000: fig. 2, c) (Fig. 1, n. 14). A richer collection of marine shell ornaments was found at Isorella (Starnini et al., 2000). The collection from this latter site includes, besides one fragment of *Spondylus* bracelet, some *Dentalium* shells (*Antalis dentalis*, Linnaeus 1758) and several pierced sea snails (*Columbella rustica*, unpublished data) (Fig. 10) retrieved thanks to the careful water-sieving of the whole pit-fill. The above finds, except for the *Dentalium* specimens that are most probably fossil shells collected from Tertiary sedimentary formations, testify for the existence of a network connecting the Po Valley sites with the sea shores.

Regarding ceramic pyrotechnology, very few information is available. At present, only few archaeometric analyses have been performed and published from potsherds sampled from Ostiano-Dugali Alti (3 samples: Mannoni, 1995), Alba-Cooperativa dei Lavoratori (8 samples: Predieri and Sfrecola, 1995), Alba-Borgo Moretta

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(6 samples: Sfrecola, 1987), and Travo-Casa Gazza (Basso, 1998–99, unpublished data; Bernabò Brea, 2004) (Fig. 1, n. 5). Other specimens from Isorella are under study and are still unpublished. However, the few available data show the use of local clay resources for pottery production, even in the case of *figulina* vessels, for whose production extremely fine, levigated clay was employed (Spataro, 2009). This category of vessels was most probably painted, but post-depositional soil conditions usually destroy the finish of the ceramic surfaces (Fig. 11, n. 2). Refined and various vessels forms (Fig. 11), the presence of a variety of pastes (fine, medium and coarse wares, *figulina* and pseudo-*figulina*), relative thickness of walls, which in some cases are only a few millimeters thin, burnished surfaces and fine, decorative patterns sometimes found still filled with a white paste, the use of grog as temper, all testify in favor of a well developed and complex ceramic pyrotechnology, with a long tradition at its back.

9. Discussion

At the present stage of knowledge, according to the evidence at our disposal, the Early Neolithic of northern Italy should be interpreted as an intrusive phenomenon attributable to the demic diffusion or folk migration (Pearce, 2013: 207) of groups belonging to two main cultural traditions: 1) the Impressed Ware, which was responsible for the Neolithization of the Adriatic and Tyrrhenian coasts, though following different modalities of spread and different speed (Biagi et al., 1993a,b; Biagi, 2003a: 141) and 2) the Fiorano-Vhò aspect that spreading along the Po River and its tributaries shows affinities with central and central-eastern Italian cultural traditions (see also Radmilli, 1972; Grifoni Cremonesi and Radmilli, 2000–01) as formerly suggested by L.H. Barfield (1972: 193).

In Liguria, along the northernmost coast of the Tyrrhenian Sea, the Impressed Ware culture sites are known mainly from caves and rock-shelters (Biagi et al., 1989) which open in the western part of the region, only 8 of which have been radiocarbon-dated (Biagi and Starnini, 2016a). Most sites have yielded just a few characteristic sherds decorated with instrumental or shell impressed patterns. The chipped stone assemblages of this latter aspect, with the exception of one single cave-site, namely the Arene Candide (Starnini and Voytek, 1997; Starnini, 1999) are badly known, although they are quite different from those of the Early Neolithic cultural groups of the Po Valley (Bagolini and Biagi, 1987). At present our knowledge of the Early Neolithic of this part of the Tyrrhenian coast is very fragmentary. It is based mainly on the results obtained from a few recently excavated sequences, and the reanalysis of old assemblages stored in museum collections. For this reason, it is currently difficult to suggest a precise sequence of the Ligurian complexes. Their chronology is variable and, in some cases, the ceramic assemblages show affinities mainly with those recovered from sites in Provence, Languedoc, and north-western Tuscany (Biagi and Starnini, 2016a).

Regarding the Vhò-Fiorano continental aspect, it would be necessary to resume research on the Sasso and Ripoli cultural aspects and their relationships with Catignano (Tozzi and Zamagni, 2003) and the Adriatic Impressed Ware for understanding the origin of the Early Neolithic of the Po Valley. Several clues indicate the involvement in the process of at least three components for the Neolithization of northern Italy: the Adriatic, the Tyrrhenian and the peninsular groups. Unfortunately, some of the Early Holocene sites located along the north-western upper Adriatic coast have been affected by dramatic morphological changes also during the Atlantic period (Antonioli et al., 2009; Fontana et al., 2014) and have been buried by millennia of alluvial and colluvial accumulation deposited by the streams flowing from the Apennines and the Po delta, as Lugo di Romagna shows.

To sum up, the Neolithization of the Po Plain is clearly an intrusive phenomenon, whose roots are most probably to be searched along the central Italian Adriatic coastline ant its neighboring territories. It is a complex process of economic and cultural change that necessarily involved a deep knowledge of ceramic pyrotechnology, wood architecture, navigation (Capelli et al., 2011, in press), new subsistence practices and ideologies, beliefs, and last but not least, the exploitation of new resources and raw materials never seen before in the region. Indeed, a ground-breaking change in the way of life in comparison to the behavioral traditions of the last aboriginal hunter-gatherers of Europe.

Acknowledgments

The Authors are grateful to S. Colledge (University College, London, UK) for the information about the unpublished AMS results, and to T. Fantuzzi (Ca' Foscari University of Venice, I) for the calibration plot of Fig. 2.

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